FOOD MANUFACTURE

Incorporating Food Industries Weekly

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A PUBLICATION OF THE LEONARD HILL TECHNICAL GROUP OCTOBER 1, 1957

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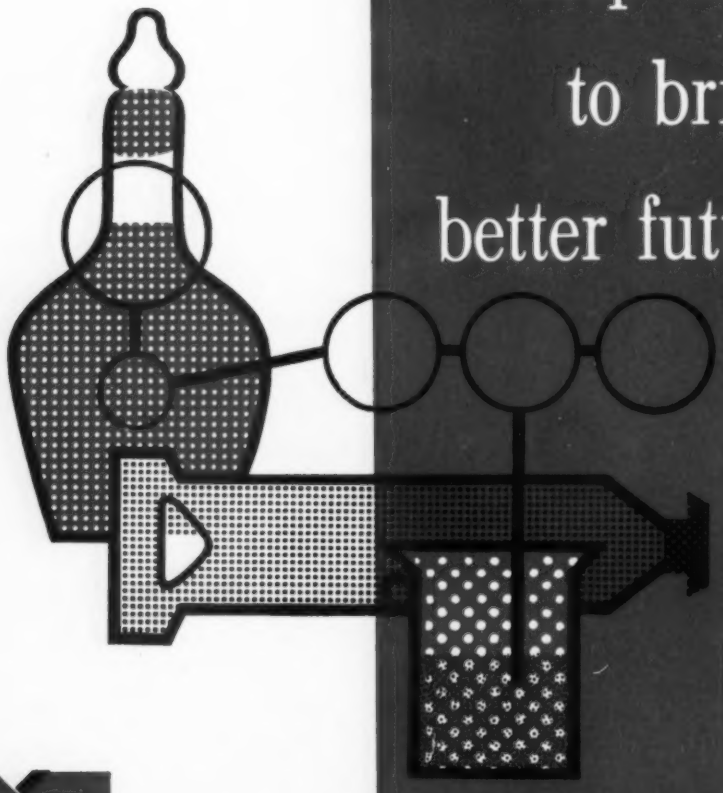

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No pre-mincing is needed, and if you wish, an automatic ejector can be fitted so that the finished mix is entirely untouched by hand.

CHECK THESE POINTS

- **No pre-mincing or hand-working**
- **No variation between choppings**
- **No rise in temperature during chopping—mincing bowl insulated**
- **No compression during chopping—full 'bloom' retained**
- **Easily operated by UNSKILLED LABOUR**
- **Large dome, therefore better cutting and no squeezing of meat and fat**

PRICES

Ser. No.	Meat Capacity	Price
Mk 30	30/40 lb.	£295 fob
Mk 40	40/50 lb.	£365 fob
Mk 60	60/80 lb.	£470 fob
Mk 80	80/100 lb.	£530 fob
Mk 100	100/120 lb.	£650 fob
Mk 160	160/200 lb.	£1,175 fob
Mk 200	200/250 lb.	£1,300 fob

Foodtech Managing Director, Mr. Helmut Hilgeland says, *'This machine is really streamlined in design—built-in insulated bowl, and,* **most important,** *two speeds are available for either coarse or fine cut.'*

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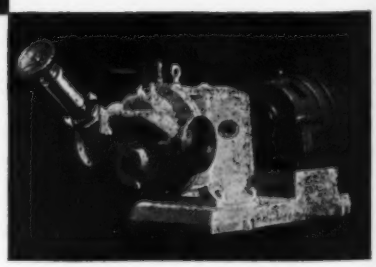

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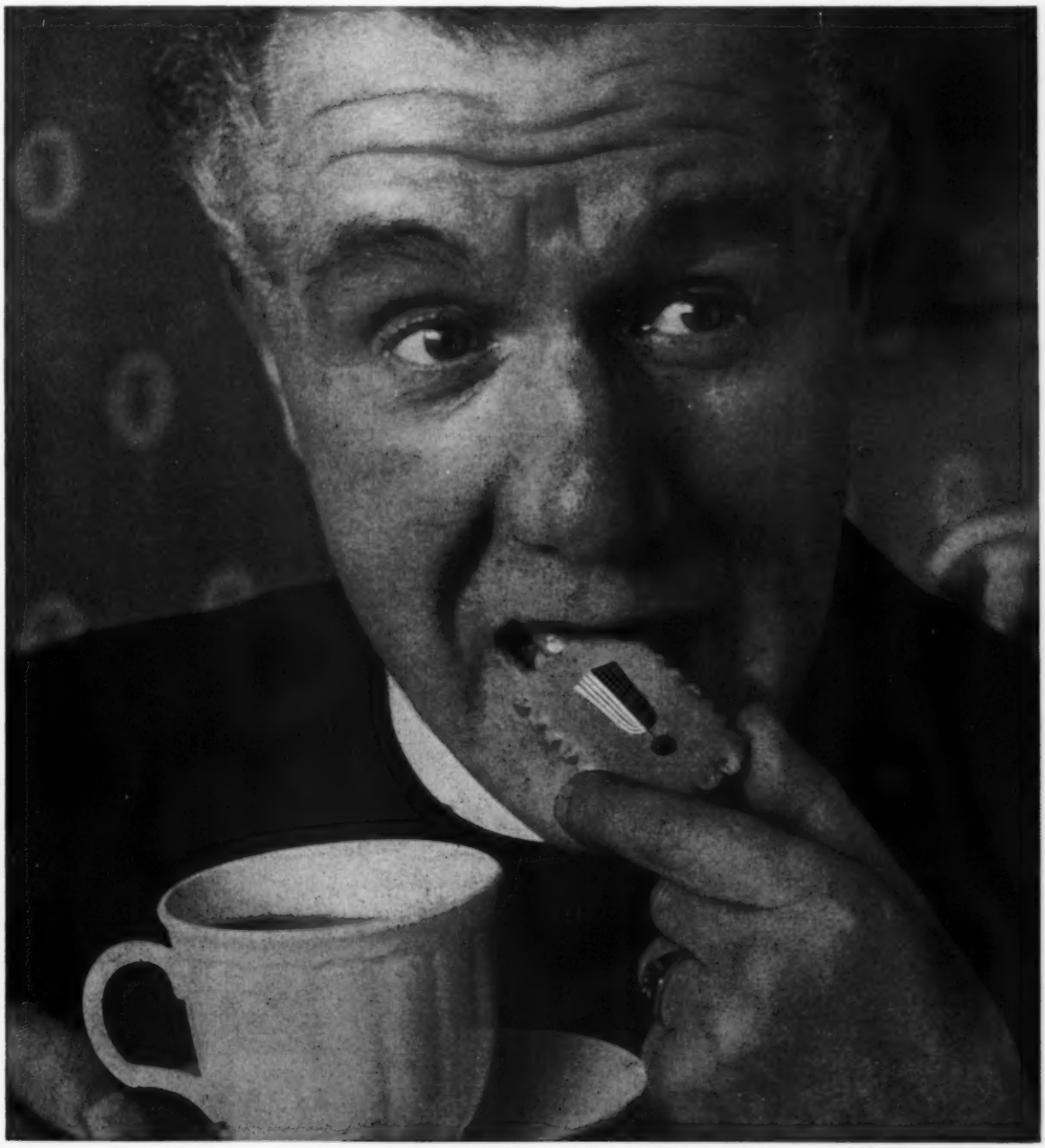

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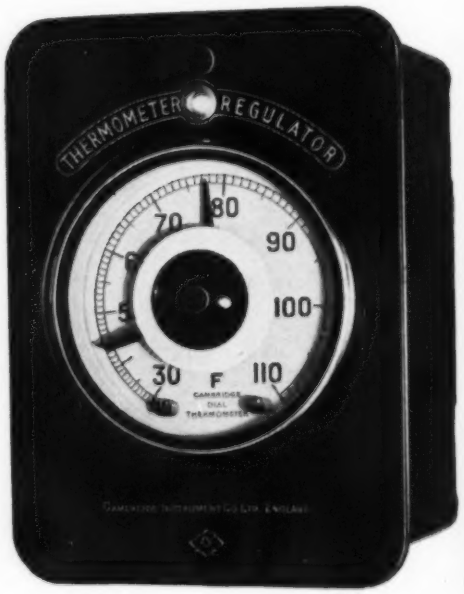

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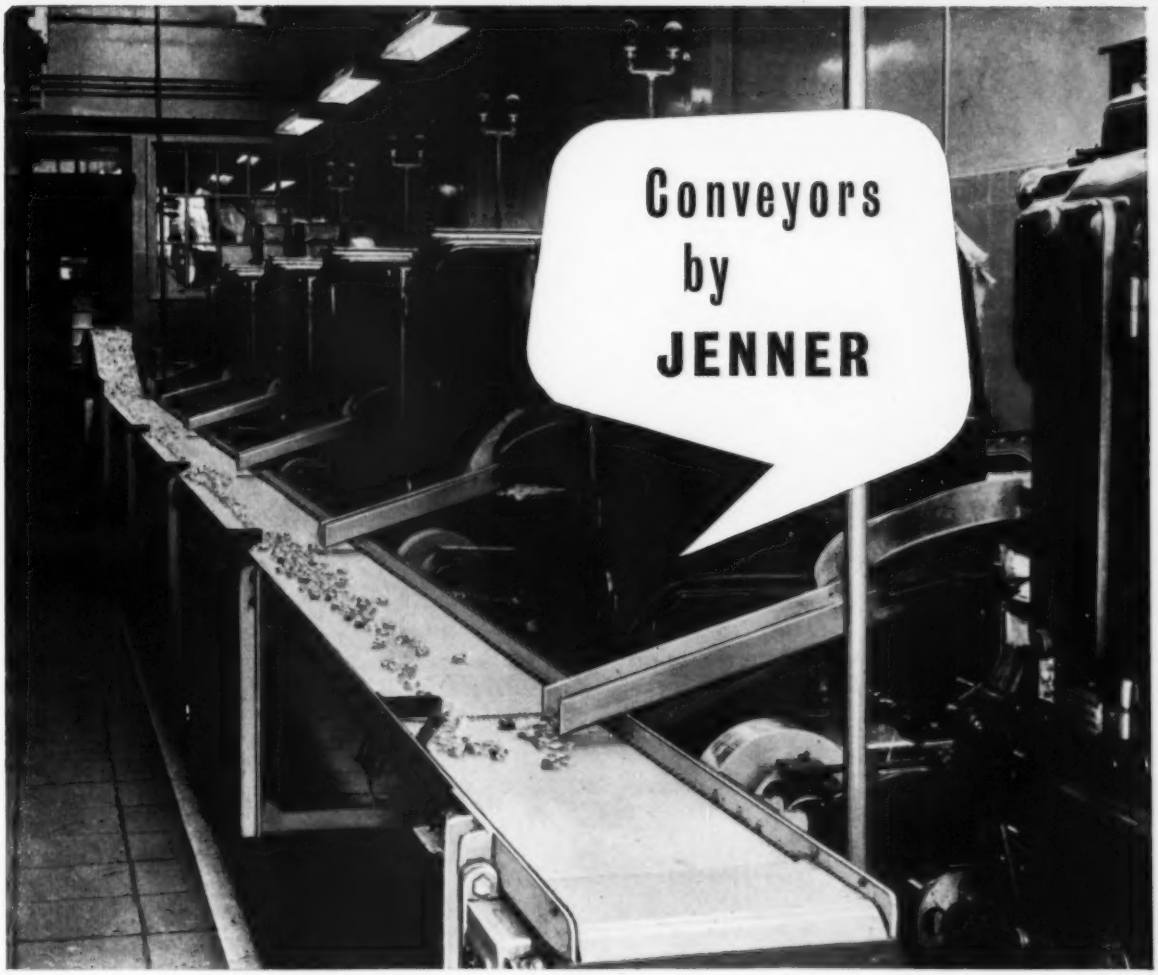

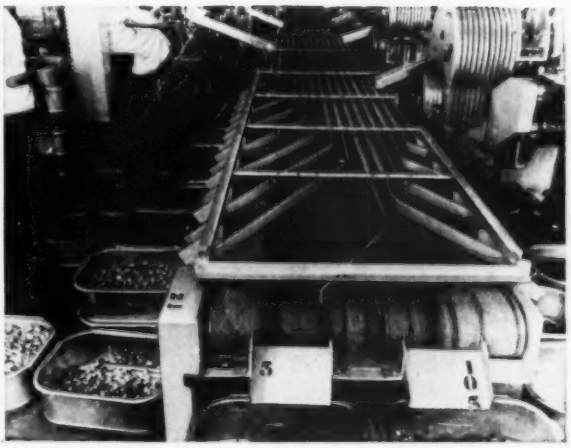

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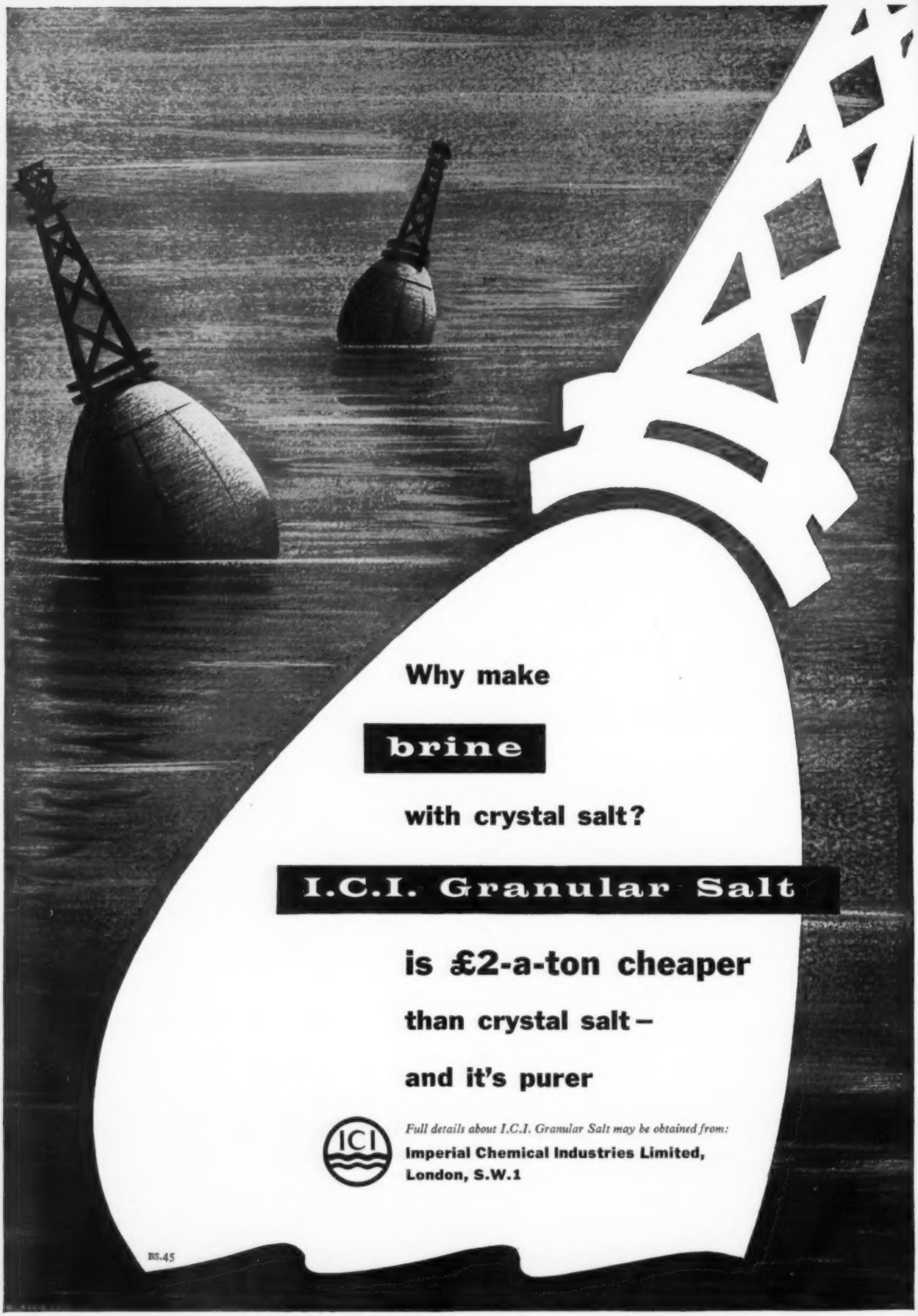
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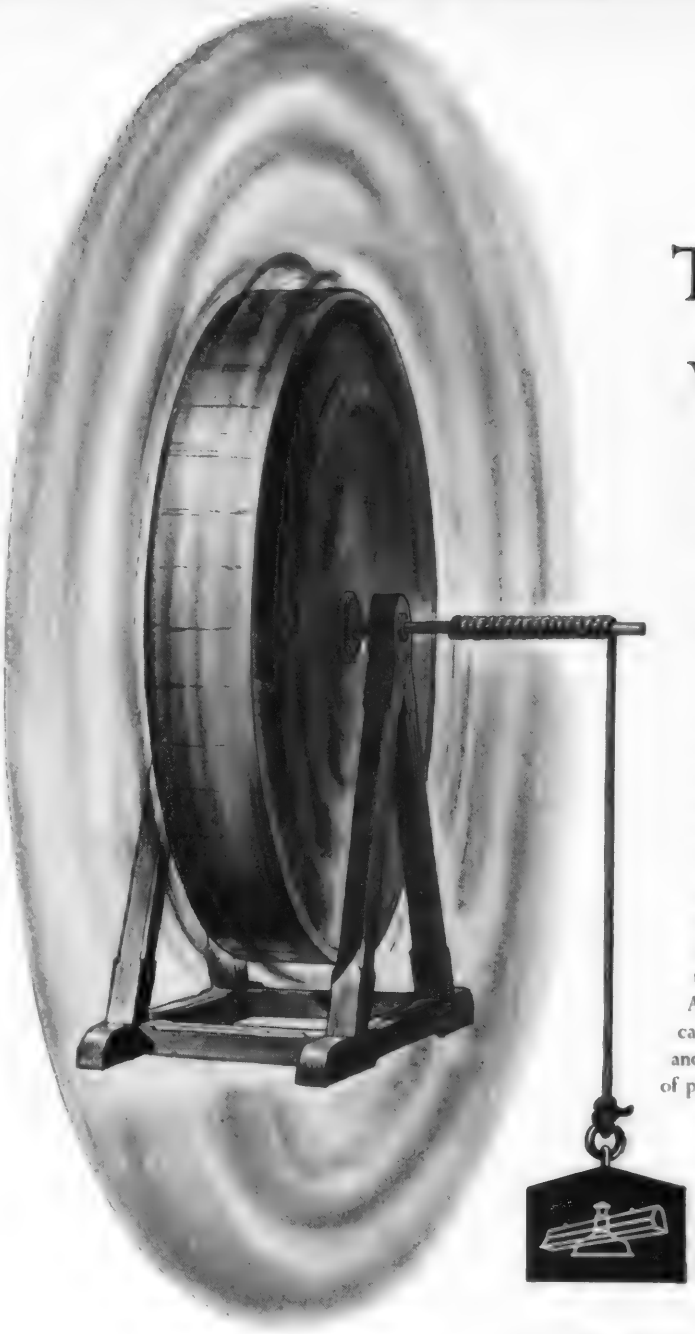

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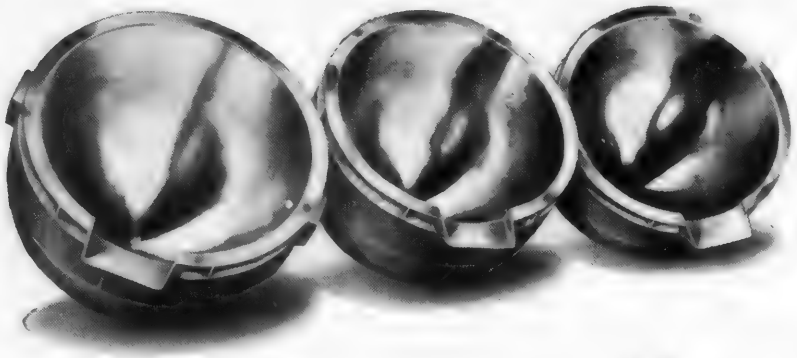

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A row of Stainless Steel Jacketed Pans for tilting pans.

Below:

A 1 ton capacity Liquid Chocolate Trolley for a well-known manufacturer of confectionery

Character?

STAINLESS

Material?

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THE FOOD INDUSTRY in particular calls for the qualities in storage and processing equipment which only Stainless Steel can provide. Butterfields meet the ever expanding demand for Stainless Steel Equipment with precise compliance to specification and a very high standard of finish.

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Stainless Steel Equipment

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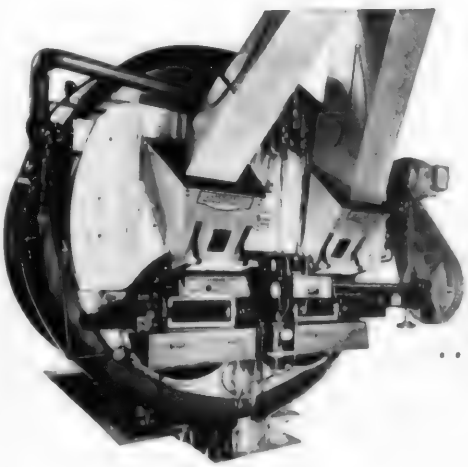
Monsanto Chemicals Plant, Newport.

... modern Industry needs modern BOILERS!



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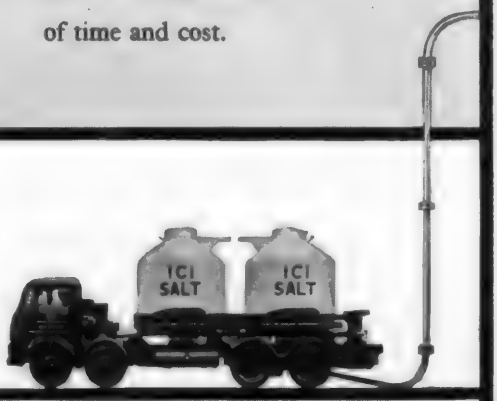

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Self-opening Separator

automatic sludge discharge

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with 'full-view' 3-seat comfort cabs and optional overdrive

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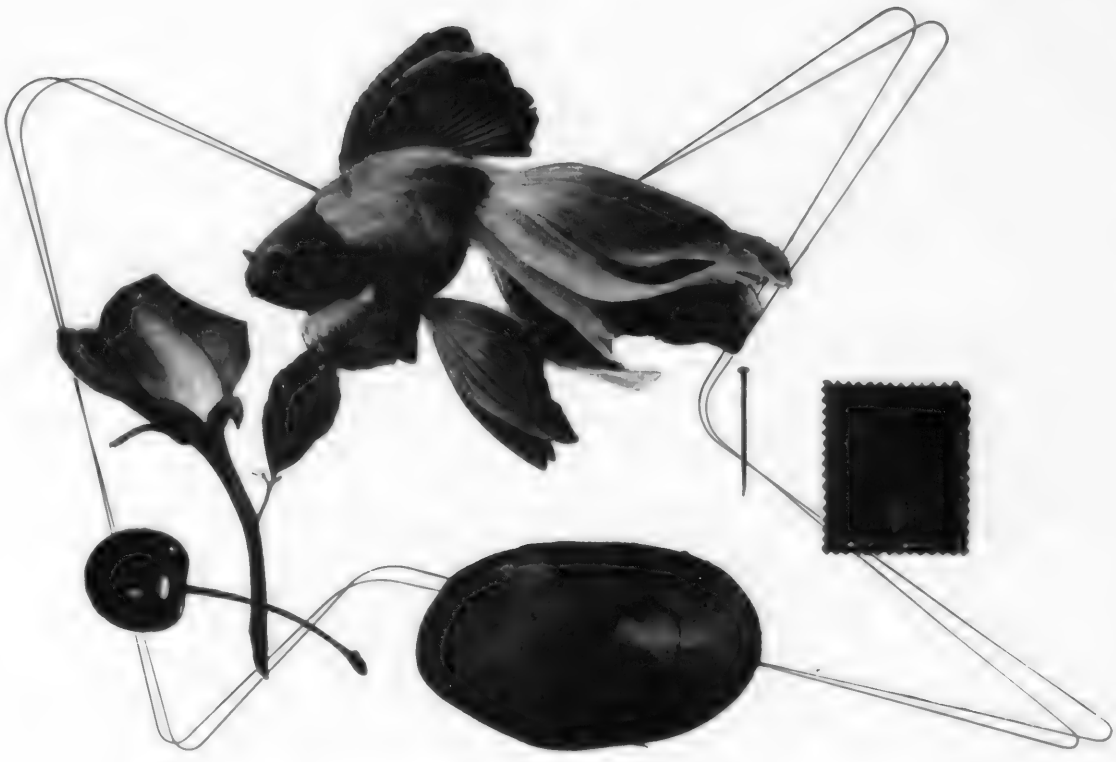

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So, too, is the variety of films. As the largest manufacturers of cellulose film in Europe and the Commonwealth and makers of the famous "Cellophane" film, as makers of B.C.L. polythene film and sole agents for Courtaulds' cellulose acetate film, we are proud of our ability to supply films in types and gauges to suit every product.

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In addition, we offer an incomparable service — help with technical, machine and package-design problems.

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"Cellophane" is the registered trade mark of British Cellophane Limited and denotes the brand of cellulose film manufactured by them.

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Apex Comminuting Mill, No. 114, Type S2. 5 h.p. fitted with under-slung motor for process operations where rigid cleanliness and complete absence of any dust pockets is essential.

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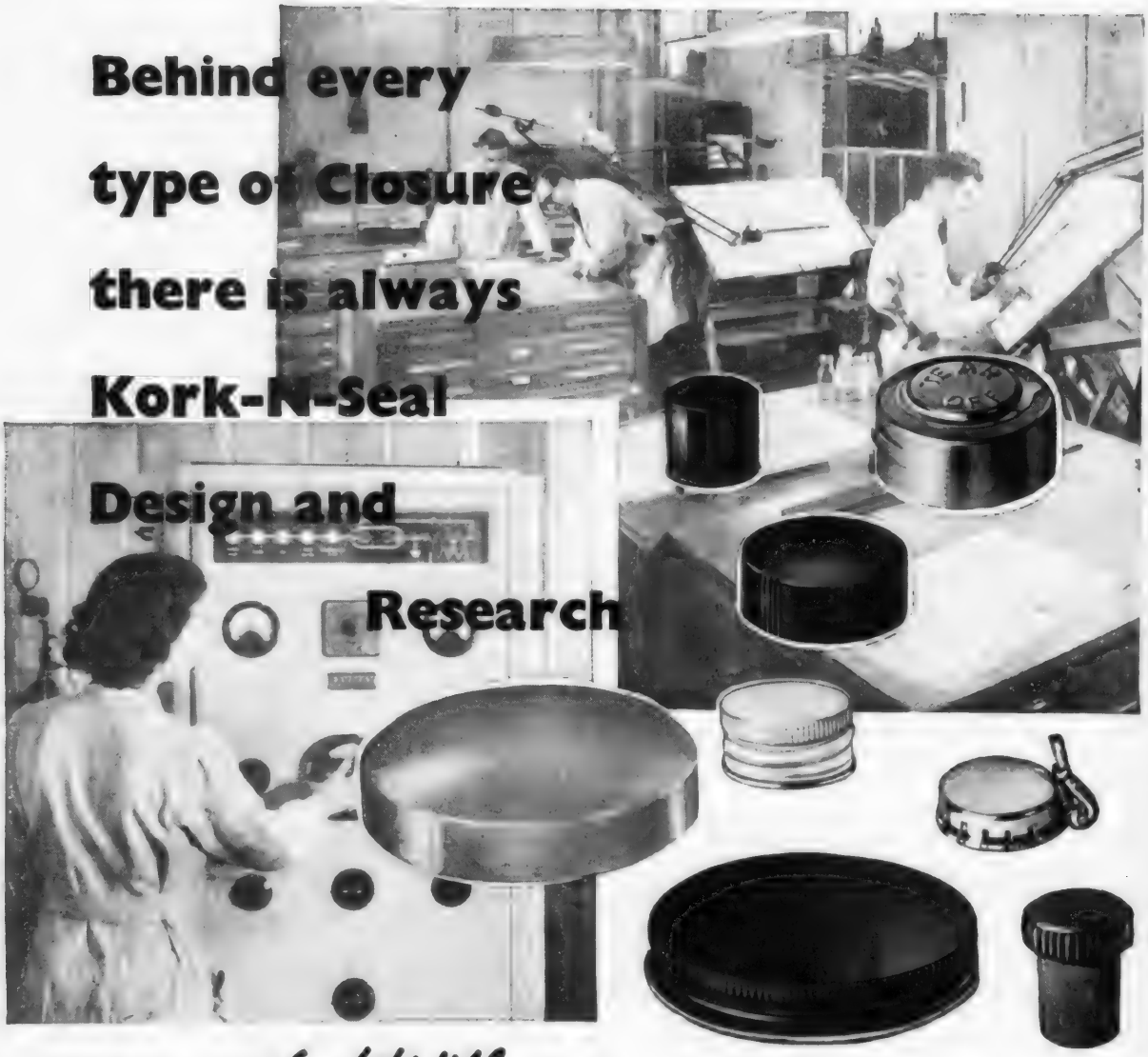

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WITH UGB GLASS CONTAINERS

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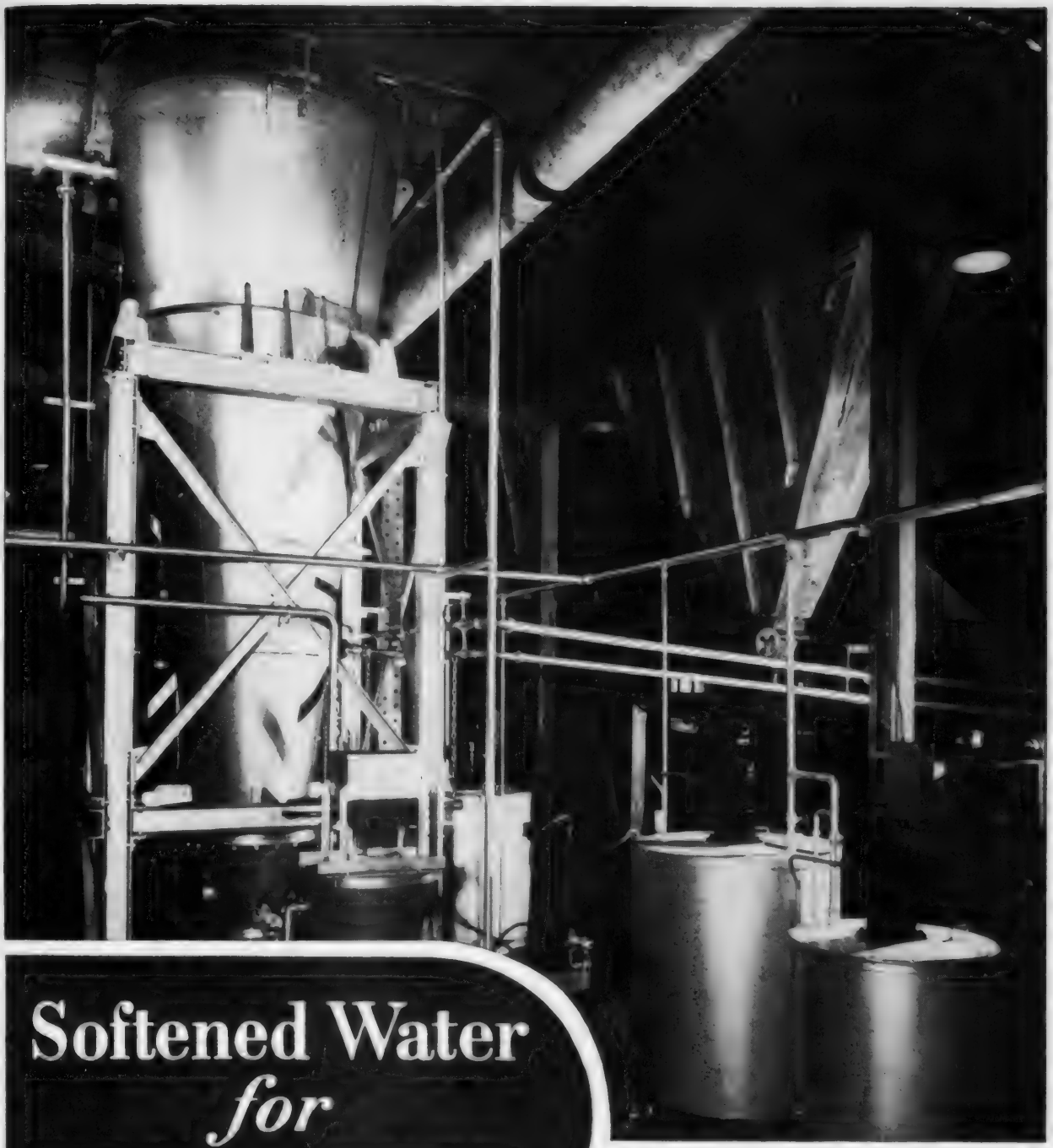

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Consistent zero-hard softened water for boiler feed is supplied by "Spiractor" cold lime softener followed by a Permutit Ion Exchange softener. This is only one of a range of Permutit plant designed to supply correctly treated boiler feed. If you require further information on Permutit boiler feed water treatment plant, please write to:—

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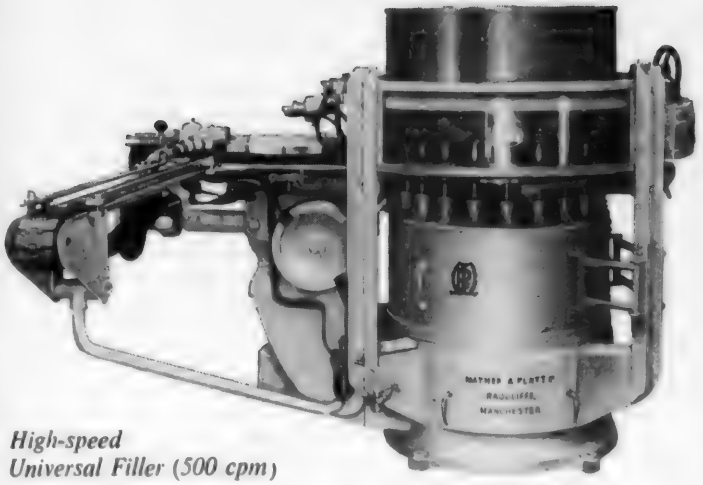
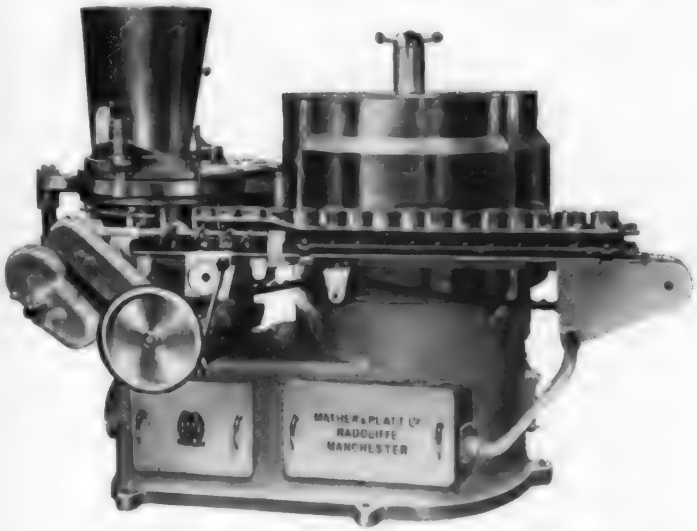


High-speed Universal Filler (500 cpm)



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A10 Can Filler (30 cpm)

MODERN FILLING MACHINERY

These modern machines are part of a new and complete range of designs by Mather & Platt Ltd for the canning industry.
They combine a high degree of accuracy with high speed and simple and economical maintenance.

Mather & Platt
LIMITED

RADCLIFFE
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606

LIQUID PROCESS CONTROL

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MEASUREMENT

Batch control for a liquid mix nowadays requires precise amounts of several ingredients to be dispensed in exact quantities. To often this job still depends on a man with a bucket and a mind of his own. MEASUREMENT. have replaced this uncertain method with a system of metered control. The quantities are pre-set on a dialled control panel and supplied to the mix, from a remote control point if necessary, at the press of a button Quantities are precise, records are automatic, control is complete and the bucket is out.

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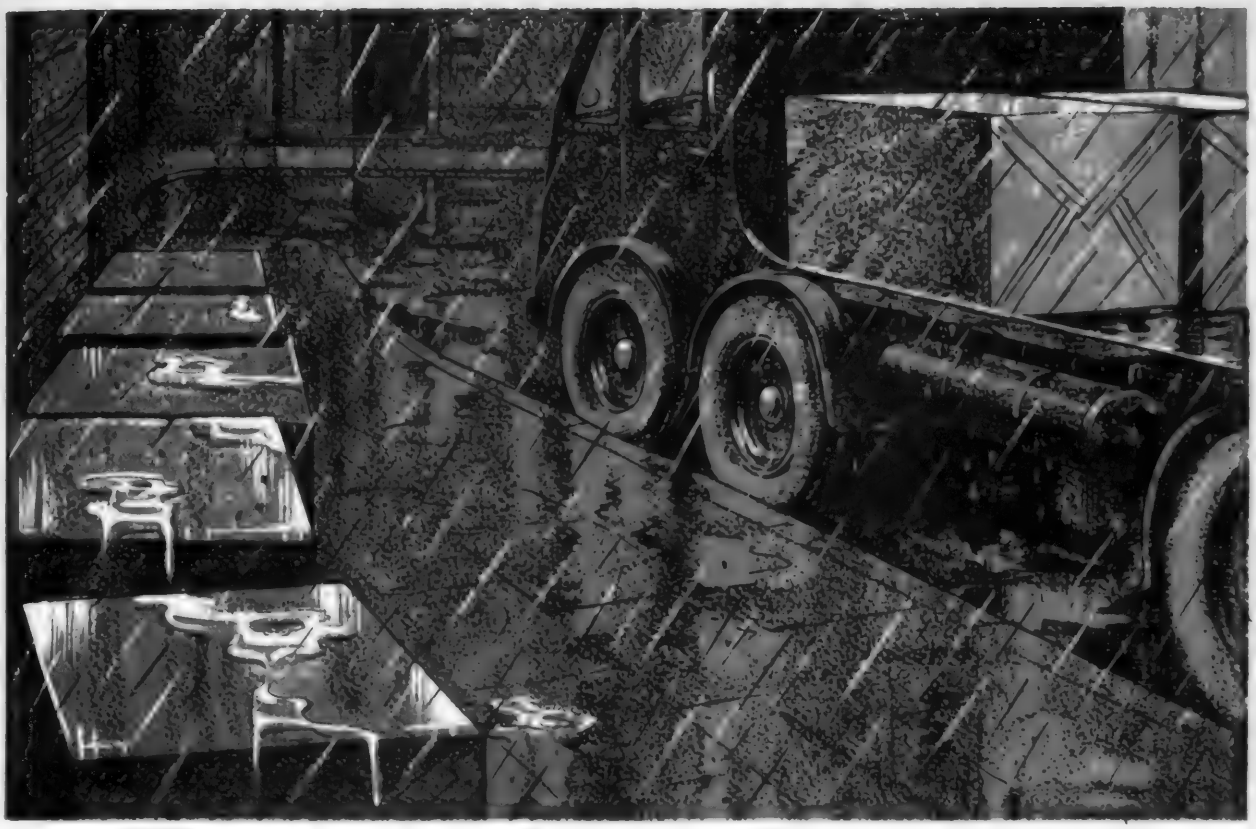

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Then you know it's safe from dirt and damp. Safe from chemical contamination. Safe in bad storage conditions. Safe for a long, long time. You know it will be factory fresh the day it's opened.

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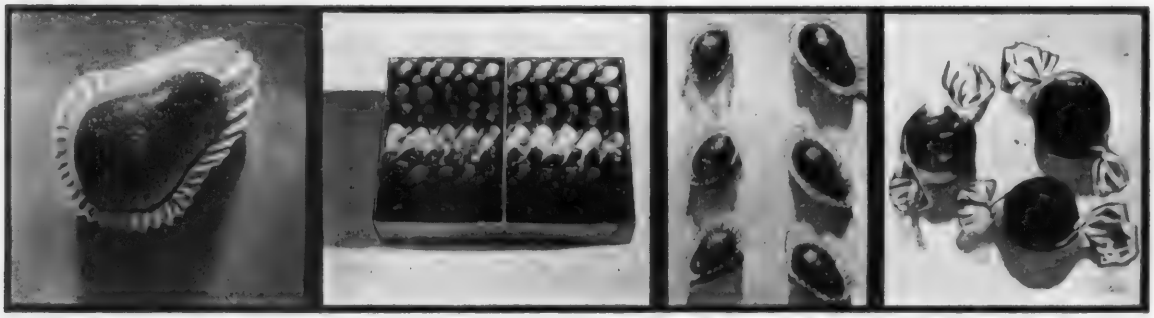

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'Globe' liquid glucose, 'Cerelose' powdered glucose, and the wide range of other starch products made by Brown & Polson Limited for confectioners, are the best of their kind—and they are backed by a unique service of technical advice to confectionery manufacturers.

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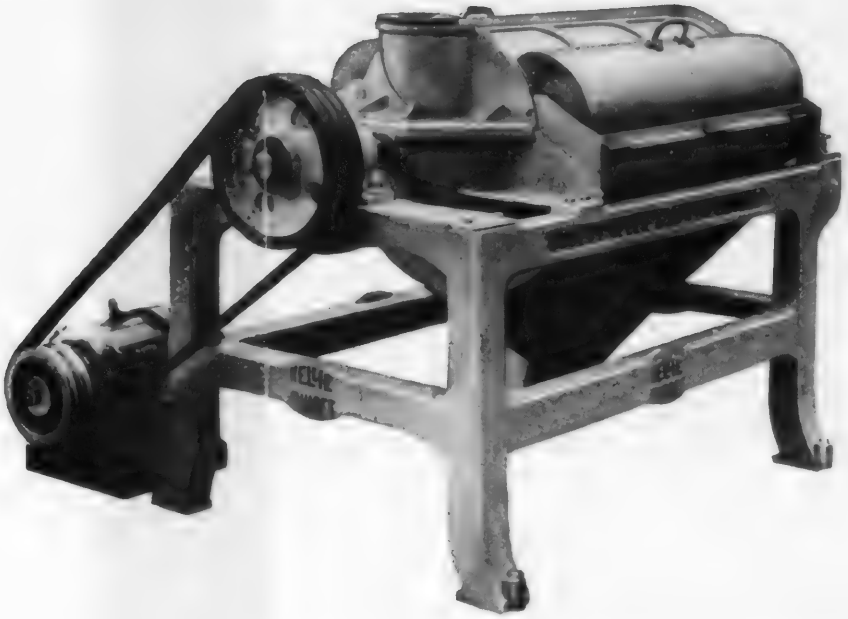

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HEAVY DUTY PULPING MACHINE

A sturdy reliable machine with a tremendous capacity, the Kellie Heavy Duty Pulping machine can easily handle up to 20 tons of material per hour. Food products such as tomatoes, apples, prunes, plums, figs, oranges, berries etc. deftly cycloned, sieved and reduced to a liquid or semi-liquid state.

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The Kellie Heavy Duty Pulping machine is capable of dealing with 10 to 20 tons per hour according to the nature of the product. The machine is equally efficient as a rougher or finisher with the use of interchangeable screens.

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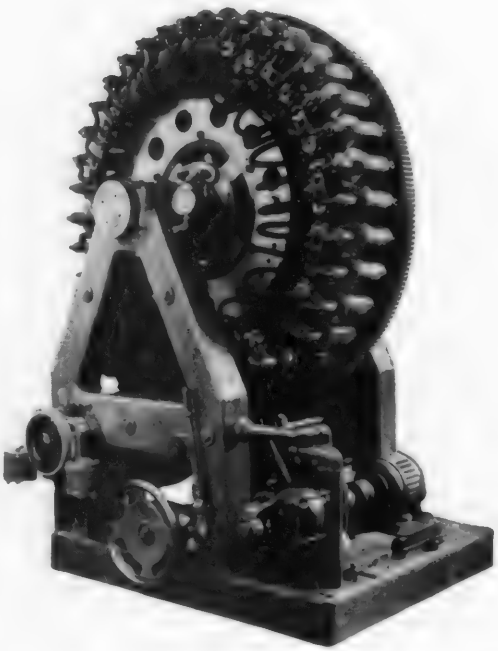

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Output: 300 cans per minute

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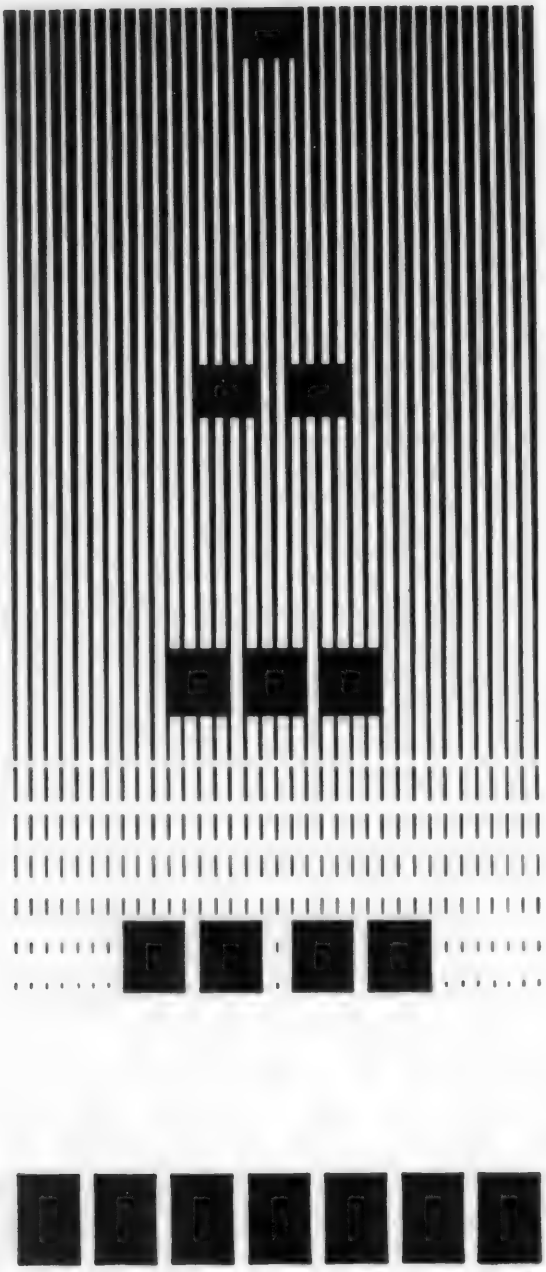

Production grows with good lighting

IN THE MAJORITY of works today the lighting is inadequate or unsuitable, or both. Production is slower than it could be, mistakes are made, health and tempers suffer.

Money spent on a planned lighting system is the best of investments. The foreman can see how things are going; the craftsman at his machine can work more accurately and easily because he can see what he's doing.

Good lighting is only one of the ways in which electricity is playing a vital part in the drive for higher productivity.

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Ask your ELECTRICITY BOARD for advice and information, or get in touch with E.D.A. They can lend you, without charge, films about the uses of electricity in industry. E.D.A. are also publishing a series of books on Electricity and Productivity. Titles now available are: Electric Resistance Heating, Electric Motors and Controls, Higher Production, Lighting in Industry, Materials Handling, and the latest addition to the series, Induction and Dielectric Heating. Price 8/6, or 9/- post free.

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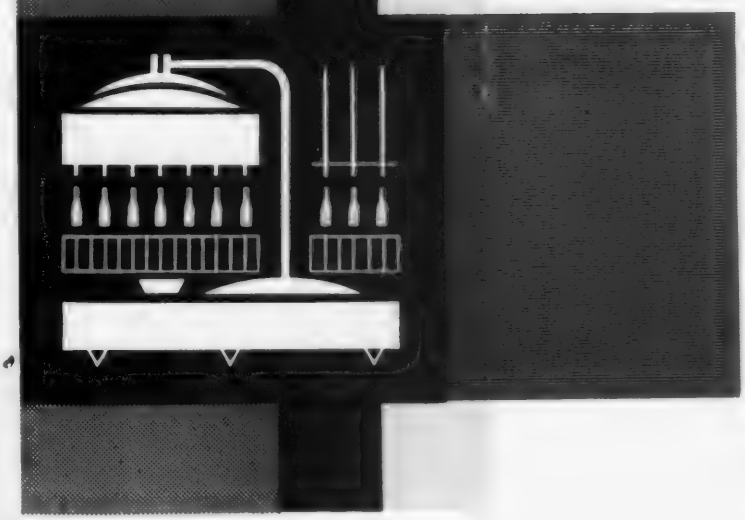
a reliable surface-active bactericide, especially suitable for the soft drinks industry



- Economical
- Readily soluble in cold or hot water
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- Penetrates and destroys infection in mixing pans, syrupers, pipe lines, fillers and bottle stoppers.

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man at work in SCANDINAVIAN country

He may be a Finn, a Norwegian or a Swede and his job is cutting timber for delivery to the board mills where it will be pulped and processed to make SCANDINAVIAN, a fine white folding box board. Being made from virgin wood pulp SCANDINAVIAN is ideal for packaging of 'sensitive' goods for it imparts no taste or odour. Moreover it can save the cost, bulk and weight of protective liners. If *you* are concerned in the packaging of a sensitive product you would be wise to enquire about SCANDINAVIAN.

SCANDINAVIAN

PURE FOLDING BOX BOARD

SCANDINAVIAN PACKING FOR SENSITIVE PRODUCTS
The name Scandinavian guarantees a pure folding box board produced by the associated box board manufacturers of Finland, Norway and Sweden.

Ask your boxmaker or agents of the FINNISH, NORWEGIAN AND SWEDISH FOLDING BOX BOARD MILLS OR WRITE TO THE INFORMATION & RESEARCH DEPT., P.O. BOX 7232 STOCKHOLM 7.

CVS-148

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using it. For this reason most of our future announcements
will be limited to new developments, with an occasional
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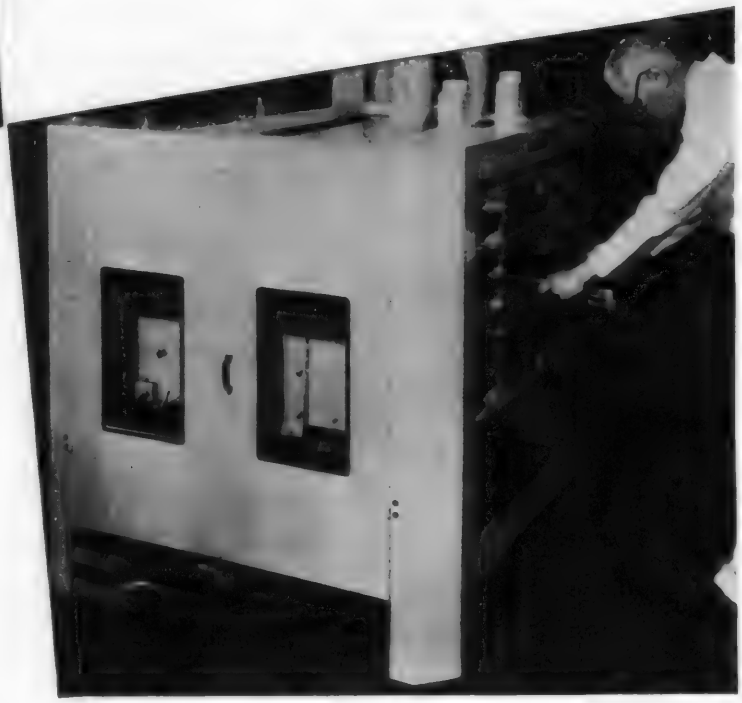
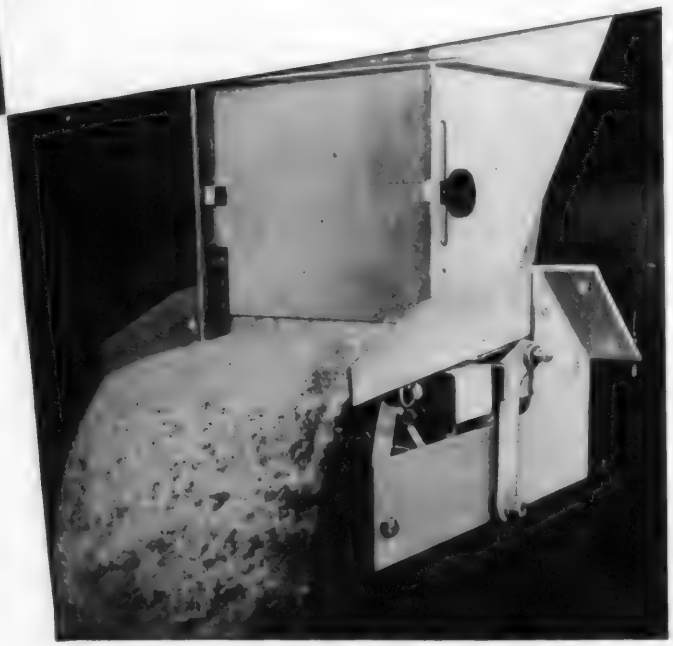
'Phone: BRADFORD 65251 (20 lines)

Sifting problems?



Not with the Simon Junior Sifter. The persuasive rotary motion of its horizontal sieves gives a gentle but positive separation of powders and granular materials. It is totally enclosed in a metal body and therefore dust-free.

Feeding problems?



Then use the Simon vibratory Velofeeder. It gives a controlled accuracy of feed on all solids from powders to 2″ lumps. Adjustments are made in seconds from high to low discharge rates within a 400—1 ratio.

Tests gladly made on your own samples. Why not consult us now?

Industrial plant by ***Henry Simon Ltd***

SIMON ENGINEERING GROUP

CHEADLE HEATH, STOCKPORT Telephone: Gatley 3621 (16 lines) Telex No. 66-287

. . . Is your output dropping?

It looks like it, from that chart. Better put the counter on those machines, you'll be surprised how many revs have dropped since your last check — you won't maintain production that way! What you need is a chain drive, where a hundred r.p.m. *means* a hundred — and keeps output up to schedule.

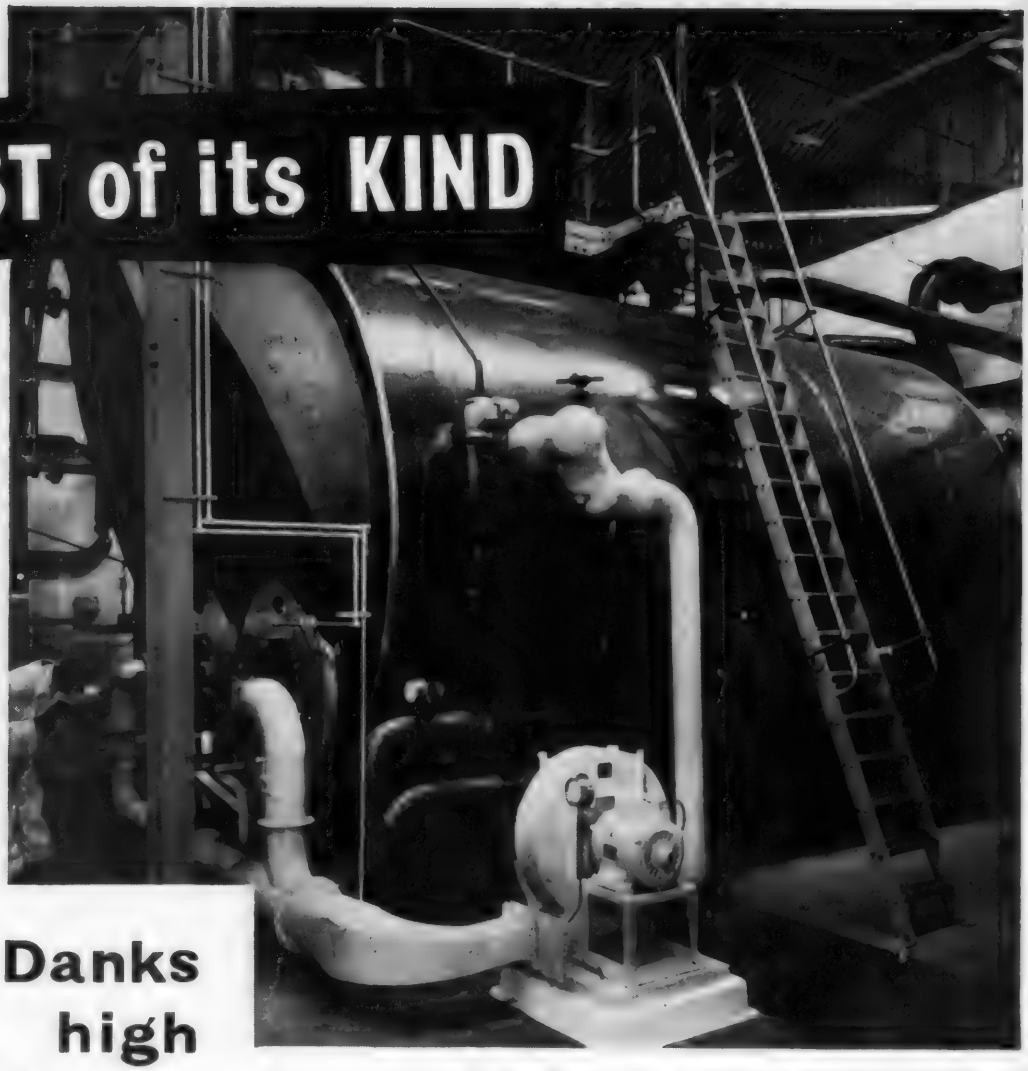
be positive-and fit RENOLD CHAIN DRIVES

* *save space* * *save power* * *increase production*

RENOLD — *the FIRST name in precision chain*

RENOLD CHAINS LIMITED · MANCHESTER

FIRST of its KIND



Edwin Danks high velocity THERMAL STORAGE economic BOILER

At the Quaker Oats Factory, Southall, Middlesex, direct injection cookers, rotary grain driers, and toasting ovens are all served by steam which is also used for the heating of factory and offices. A widely fluctuating steam demand is achieved by the installation of this special oil-fired boiler.

Working at 250 psi pressure, the boiler has a normal output of 15,000 lbs. of steam per hour but can work at a 25% overload rating when necessary. Variations in steam demand are dealt with by the thermal storage of hot feed water which enables the factory load to be evened out and the firing rate kept constant. Substantial fuel economies and increased efficiency are obtained without the use of expensive and bulky accumulators or additional tanks. Designed for coal or oil firing.

EDWIN DANKS & CO. (OLDBURY) LTD.

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THE LATEST R.O. TAMPERPROOF SEAL

★ SECURO SEAL BEFORE FIXING

★ SECURO SEAL FIXED & TAMPER-PROOF...READY FOR TRANSIT

UNIQUE DESIGN OF SECURITY BAND BRINGS ADDITIONAL ADVANTAGES

Hundreds of firms have proved the effectiveness of the R.O. Pilferproof Bottle Closure, and now here is the SecuRO Seal to give even greater security as well as the following advantages.

1 The SecuRO Seal has a right-hand thread and the Security Band a left hand thread making it easy to break the perforated portion.

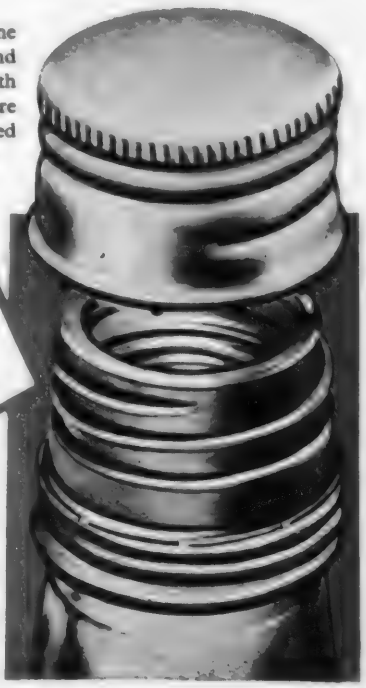
2 The Security Band can be readily unscrewed and disposed of without cutting.

3 The SecuRO Seal is 100% tamperproof.

4 The SecuRO Seal has a greatly enhanced appearance.

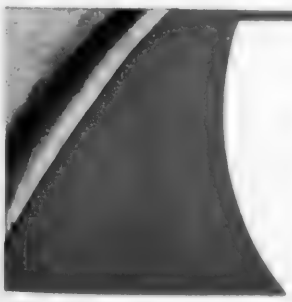
The SecuRO Seal can be applied by any R.O. Sealing Machine suitably adapted. A small change in the glass finish will be necessary but this can easily be effected.

The tell-tale 'click'. When the SecuRO Seal is unscrewed, cap and Security Band part company with an unmistakable 'click' to assure the customer that he has received the contents intact and undiluted.



★ *SECURO SEAL BROKEN BY THE CONSUMER*

But instead of Band dropping down neck of bottle, it remains on thread and may be removed by unscrewing!



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PROSPERITY

begins with an ATMOS

Photograph by courtesy of Drings Ltd.

The ATMOS *Smoking & Cooking Plant*

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Among its many advantages are the facts that drying, steaming, smoking, cooking and cooling are all carried out in a single process; air current heating, with humidity adjustment, reduces weight losses and improves flavour; costs of heating and smoking materials can be reduced by as much as 80%.

For fuller details of this brilliantly designed plant, please write to :—

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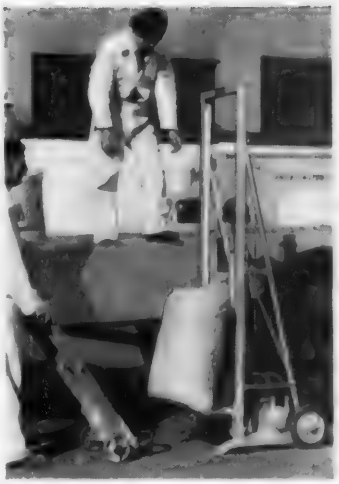
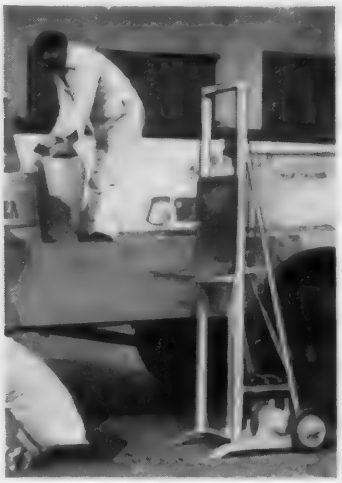


The BRIMPEX *in position and started. The sack has been tipped on to the platform and is sent* ***automatically*** *on its way up.*

The sack, having reached the required height remains in this position until removed on to the wagon.



The platform is ***automatically*** *returning to its starting position after the sack has been removed.*

No other lifter like it!

The above illustration shows one of the BRIMPEX *Lifters at work in the pickles department of H. J. Heinz & Co. Ltd. This model is specially fitted with stainless steel delivery platform.*

Fully Automatic Lifting is achieved for units up to 2½ cwts. when simply tipped on to the platform of "BRIMPEX" Self-actuating Lifters at the rate of up to 60 tons per hour.

The *Standard* model can be supplied to lift either to approximately 5 ft. or 7 ft. according to your needs; while the *Telescopic* model is made to take your loads up to a height of 9 ft. 2 ins. and above if you require. Rate of lift is approximately 1 ft. per second on all models and loads can be removed at any height on the way up Available with either electric or petrol engine power.

- ★ *Fully automatic or hand lever valve controlled*
- ★ *Easy transportability*
- ★ *Lifts up to 2½ cwts. at a time*
- ★ *Cannot be overlooked*
- ★ *Built to last*
- ★ *No vulnerable exterior operating gear or chains*
- ★ *Manpower saver*

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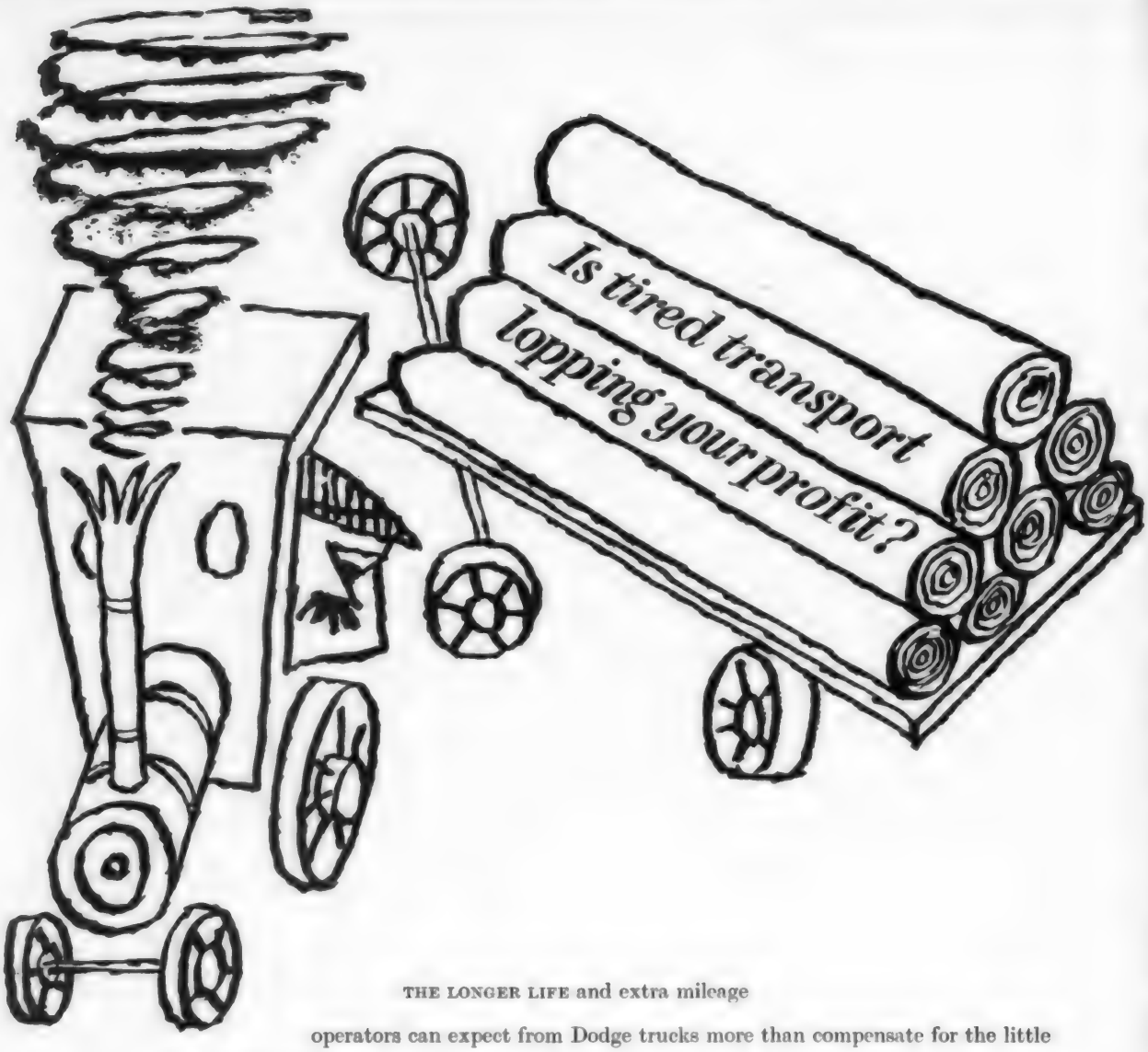

THE LONGER LIFE and extra mileage operators can expect from Dodge trucks more than compensate for the little extra initial outlay. All Dodge trucks have been designed to withstand hard wear and with their many built-in "extras", maintenance and general running costs are substantially reduced. Every one of the 30 job-rated models can bring extra profit to an operator.

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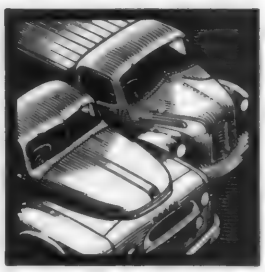
- PETROL OR DIESEL POWER UNITS
- LONG OR SHORT WHEELBASE CHASSIS



Kew **More and more operators are finding**

DODGE trucks

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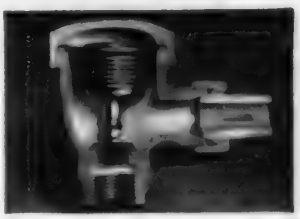
Have you seen the Drayton book on steam trapping? It shows how you can boost your steam supply and lower your trapping costs.

The 'DRICO' Balanced Pressure Trap

The thermostatic trap with a bellows element guaranteed for 2 years and up to 75 lbs./sq. in. Low in first cost, compact, completely reliable. For radiators, steam coils, heaters, canteen appliances, etc. Available ex-stock, angle and straight-way, ½" and ¾" sizes.



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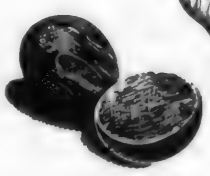

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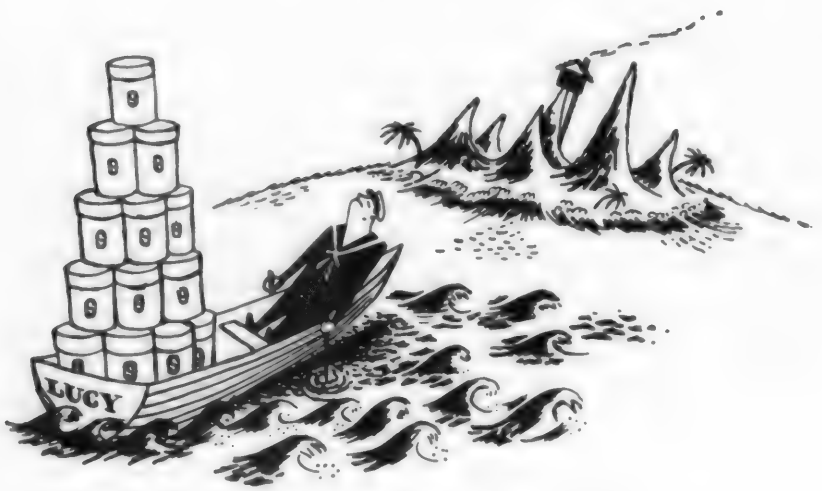

Going out into the world

A mention of "going out into the world" had a remarkable effect upon our new artist—we may not have to fire him after all! Making allowance for artistic licence, he grasped more or less what we were driving at right away.

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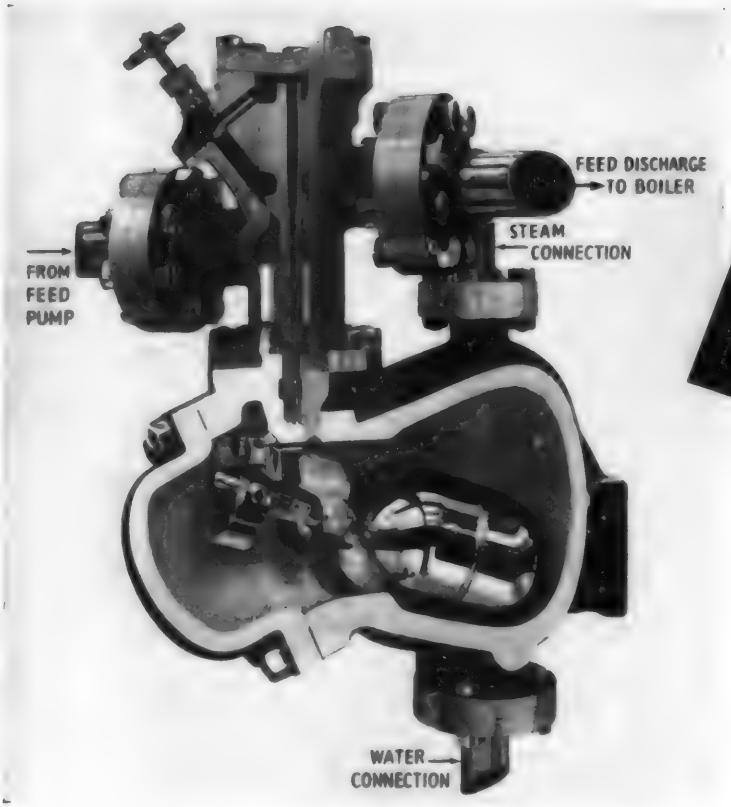

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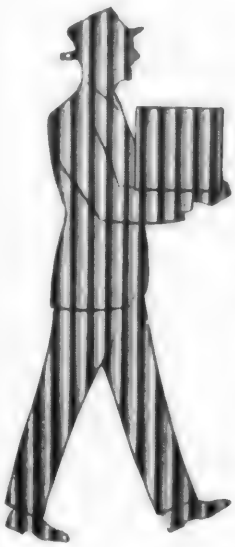
A case for everything and everything in its case ...



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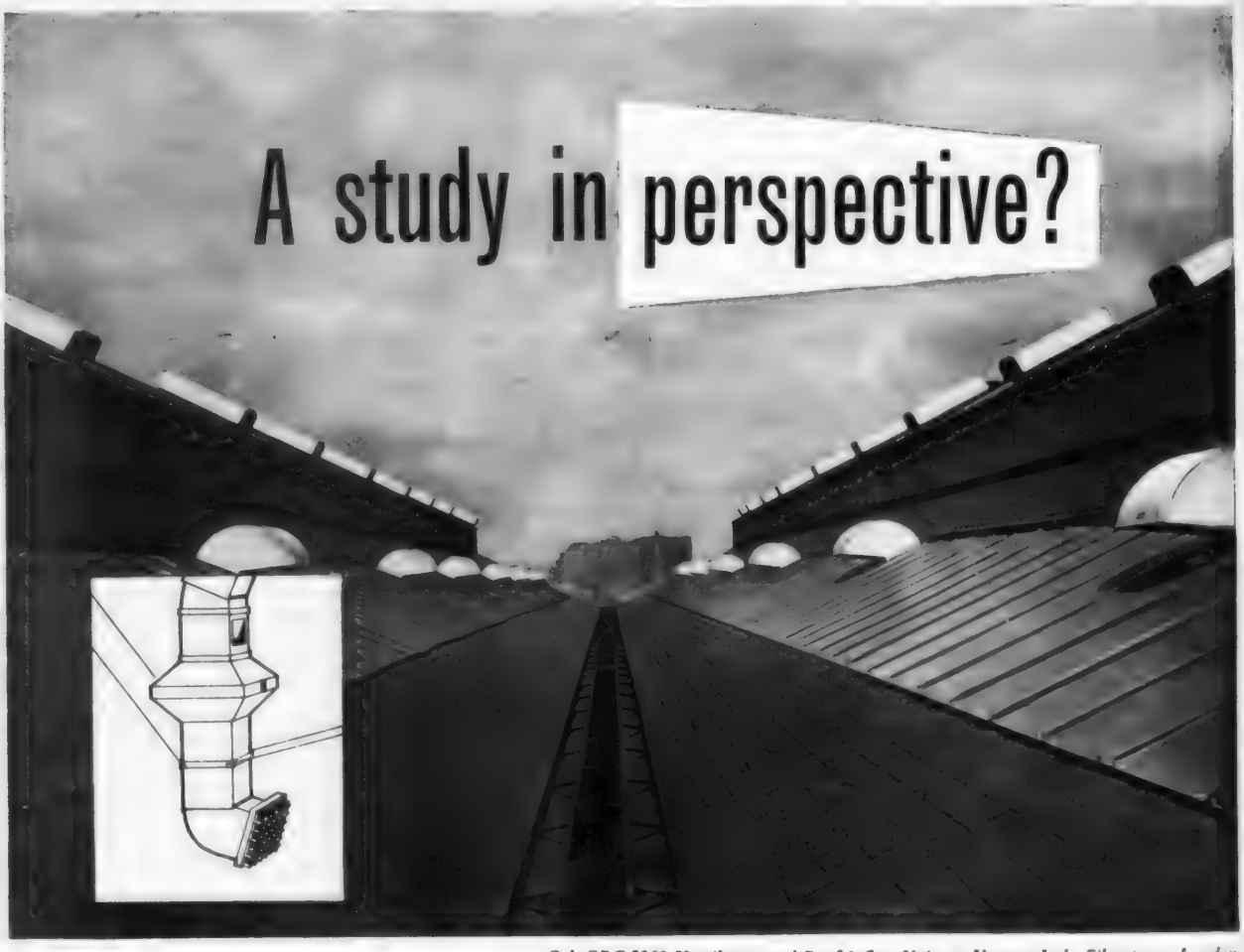

Colt SRC.2060 Ventilators and Roof Inflow Units at Venesta Ltd., Silvertown, London.

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Colts were called in by Venesta Ltd. because an expansion programme involving the installation of new, more powerful plant in ' F ' block of their factory, foreshadowed a further deterioration in the already over-heated working environment.

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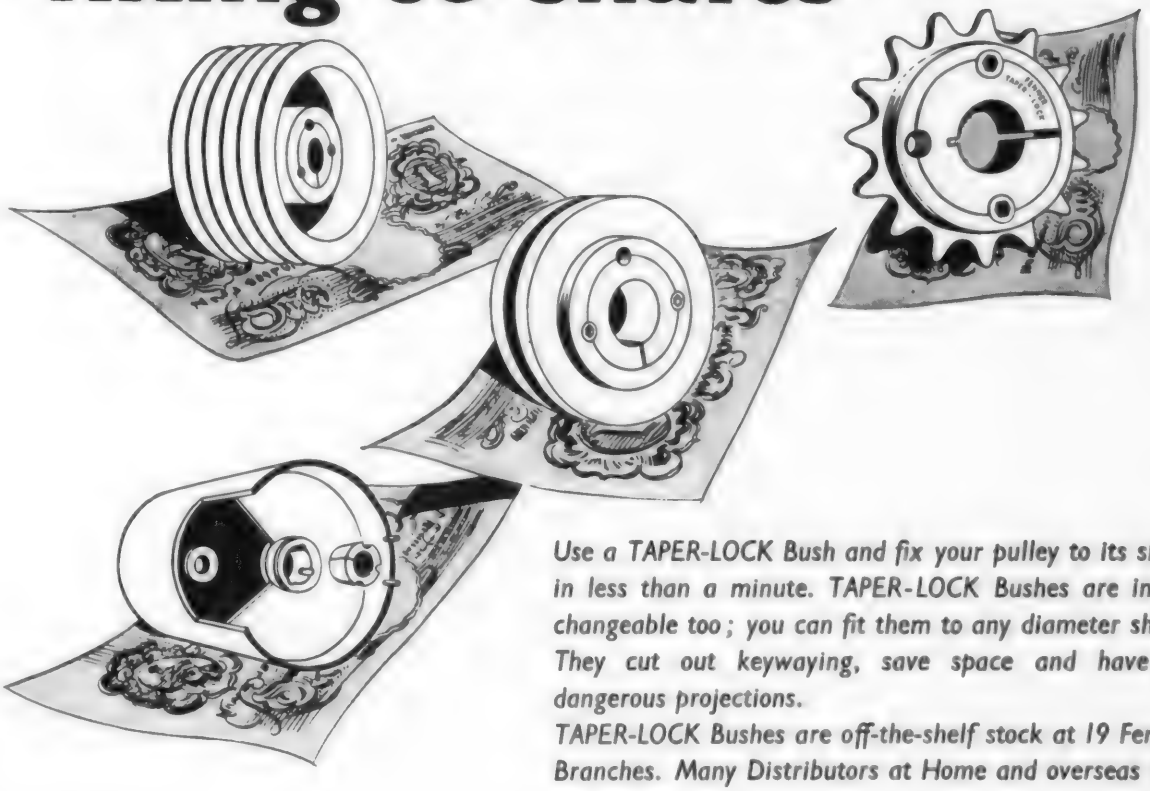
Save money— make TAPER-LOCK your standard method of fixing to shafts



Use a TAPER-LOCK Bush and fix your pulley to its shaft in less than a minute. TAPER-LOCK Bushes are interchangeable too; you can fit them to any diameter shaft. They cut out keywaying, save space and have no dangerous projections.

TAPER-LOCK Bushes are off-the-shelf stock at 19 Fenner Branches. Many Distributors at Home and overseas also stock them.

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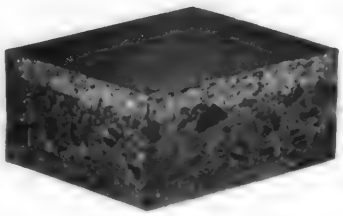

*Stelcon Floors are made in steel plate form or with a top surface of steel chippings in concrete — which means they are exceptionally tough, hard-wearing and free from maintenance bills. They are literally steel clad . . . *see!*

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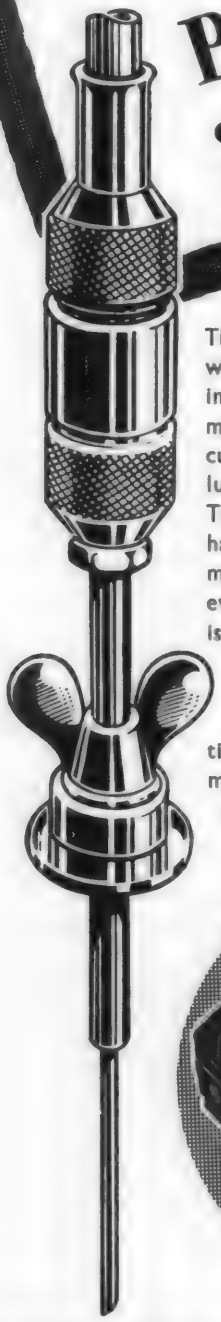
of canned foods in an autoclave



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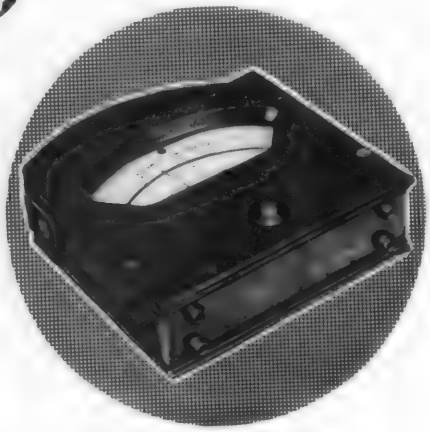

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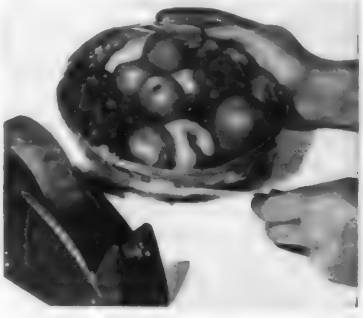

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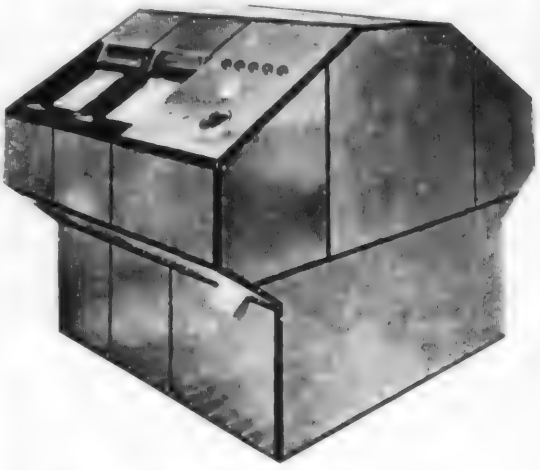

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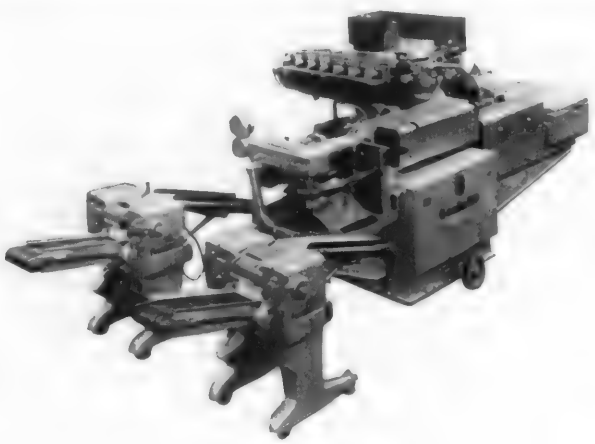

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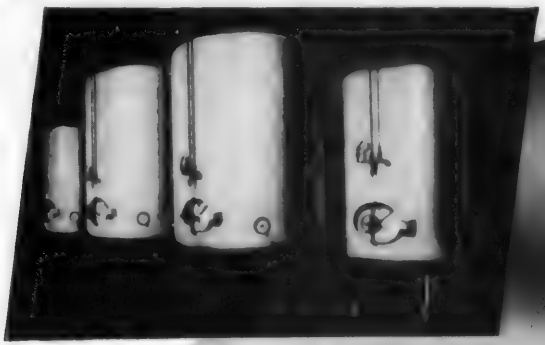

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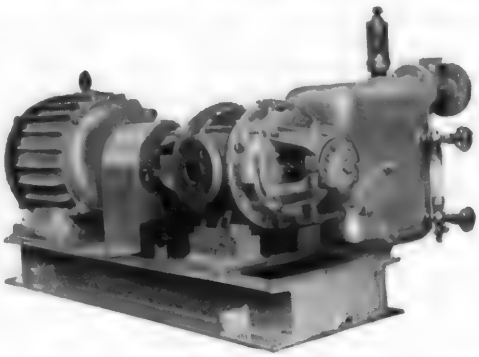

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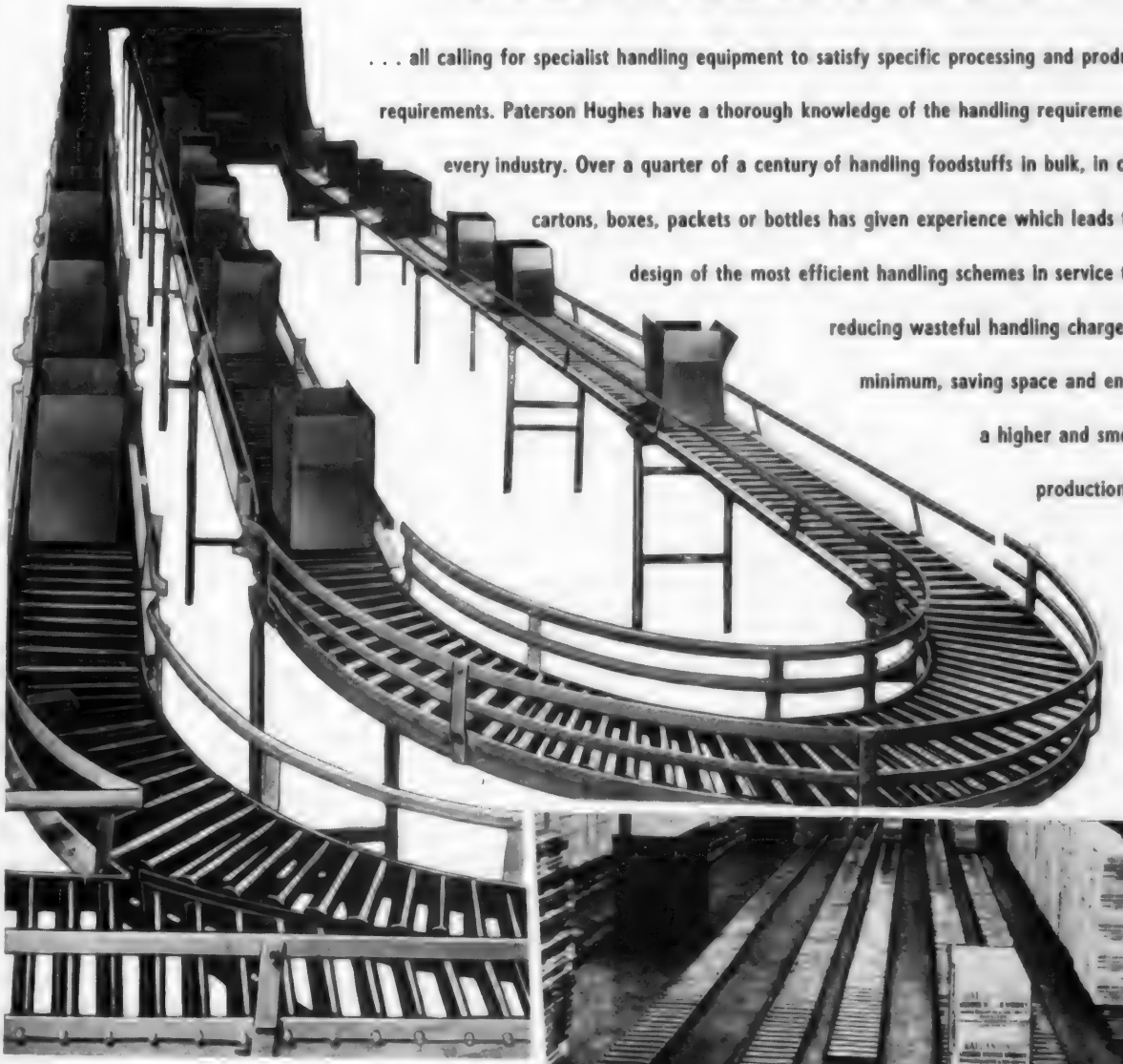

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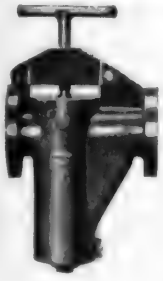

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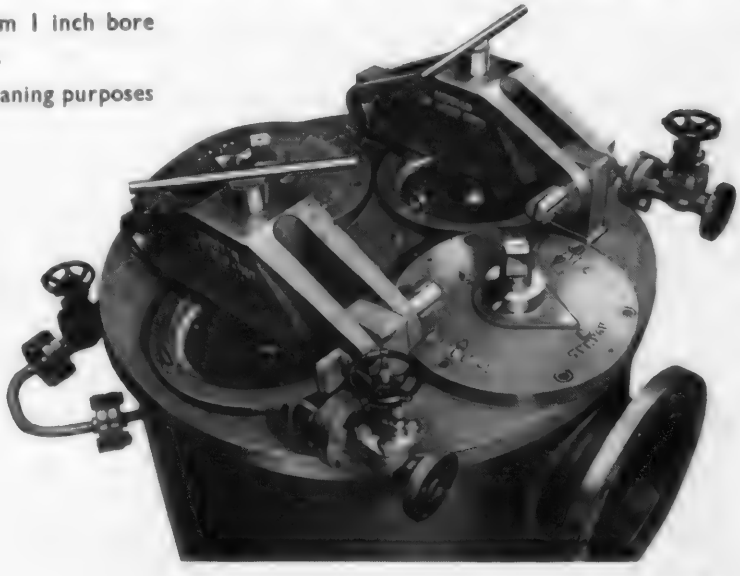

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FOOD MANUFACTURE

Vol. XXXII, No. 10 October 1, 1957

Economics of the British pig

THE position of the British producer of pigmeat changed sharply in 1956 when import quota restrictions upon overseas bacon and pork were replaced by a 10% *ad valorem* duty. Tariff protection is not the only assistance still given to the pig farmer, however; under the 1947 Agriculture Act, there is guaranteed price support, and although this now tends to contract at each Price Review, its cost for 1956/57 is estimated at over £40 million. It can be argued that this large subsidy is an economy in that it saves foreign exchange; and, indeed, it does, for otherwise much more overseas bacon and pork would be bought by housewives despite the 10% duty. But this argument is far from watertight. The home industry of pig farming is heavily dependent upon imported feedingstuffs. The exchange spent upon these must be deducted from any calculated figure for the saving of exchange on overseas bacon and pork.

The cost of feeding pigs is by far the biggest cost in producing pigmeat. This has been shown by a recent economic study carried out on pig farming in the south-west by the University of Bristol.* For every £100 of output, £71 was spent on food and only £10 on all other costs. The rest was the producer's margin. A profit margin of 19% might seem a high average for an industry so dependent upon aids, but as it also includes the reward for the farmer's management and the charge for his invested capital, it cannot be regarded as unreasonable.

Very little of the food is grown on the farms. An analysis of types and costs of food showed that 89% of expenditure was for purchased foods and concentrates, with most of this spent upon imported foods. Compounded feedingstuffs are predominantly used—their cost is 60% of the total food bill. The economists who carried out the survey suggest that the greatest immediate reduction in food costs would lie in buying uncompounded feedingstuffs, grinding them and mixing them on the farm. There may be some reality in this argument. Obviously home production costs for bacon and pork can be significantly reduced only be attacking the heavy bill for food. But a more fruitful field for economy surely lies in improving the efficiency of food utilisation, in securing a higher rate for the conversion of food into liveweight. Indeed, this is borne out by evidence in the survey. The five farms with the best profit margins and the five farms with the lowest were cost-compared. The main difference was that on the best five it took 4·8 lb. of meal to bring each pound increase of liveweight and 5·8 lb. of meal to do this on the worst five. This led to a profit margin per bacon pig of £5 2s. as against the small margin of £2 2s. On both groups of farms the price for food was much the same, 3d. per cwt. higher for the more profitable group. In short, it is not what the food costs as much as what is done with it that counts. Though the non-food costs are proportionately low in pig farming, better attention to these items inasmuch as they affect conditions of pig rearing and fattening may well be the best way to bring down food costs. It may be necessary to spend more upon these items, a little extra, say, on housing if it leads to a substantial improvement in efficiency of food utilisation.

One conclusion of the economic study cannot be disputed—"the case for a large pig industry can never be strong until, by reducing his costs of production, the British pig producer can reduce his dependence upon Government subsidies." The taxpayer must eventually ask why the Danes, without subsidies, can produce bacon that competes despite its 10% tariff duty.

* "An Economic Study of Pig Production in South-West England." By E. Burnside and R. C. Rickard. Univ. of Bristol Agric. Economics Report No. 99. 1957. 2s. 6d.

Food instead of insulin?

COMPOSITE foods may eventually be substituted for the drugs now used to control hypoglycæmia as a result of studies initiated by the Central Food Technological Research Institute in Mysore, India. The studies were inspired by observations of the effect of certain Indian protein foods on diabetic patients. For about three months a diabetic patient who required 20 units of insulin a day was fed a diet which included about 4 to 6 oz. of a species of tender field-beans called *Dolichos lablab*—a popular seasonal vegetable in southern Mysore. He ate little fat during

this time, though he ate large quantities of carbohydrate (rice). The patient took no insulin, but, surprisingly, his fasting blood sugar level and postprandial peak had become almost normal: he had no glycosuria during the period.

The tender seeds only had this effect. Mature dolichos were less successful. The same patient derived similar benefits from a diet of *idli*, a steam-cooked preparation of the fermented dough of black gram and rice which is commonly eaten in South India, or diets containing a lot of skim-milk powder. Similar experiences were found with other hypoglycæmic patients, though the degree to which glycosuria diminished varied.

As a first step towards understanding the cause of these changes, Dr. Srinivasan of CEFTRI determined the effects on blood-sugar levels and glucose tolerance of ingesting known quantities of certain protein foods and proteins in three hyperglycæmic and two healthy men. Describing the results (*Lancet*, 1957, (6990), p. 317), he reports that casein, protein from tender dolichos, from black gram and black gram itself were effective. A legume pulse called *Thur dhal*, protein from mature dolichos, gelatin and a mixture of amino-acids as in casein were less effective.

Incomplete as they are, these results are promising both clinically and as a potential outlet for manufacturers of dietetic foods. The reduction of the blood-sugar by protein after ingestion of a carbohydrate has been demonstrated before, but Dr. Srinivasan's experiments seem to throw fresh light on this hitherto neglected function of protein. A systematic study of the effects of protein on blood-sugar levels seems indicated, which might eventually result in a dietetic composition of glucose and an effective protein for the diabetic patient.

A respite from tinplate worries

FOR the first time since 1939, food manufacturers can be confident that tinplate supplies will be adequate for their needs. This is the view of Mr. G. C. C. Chivers, of the Metal Box Co., Ltd.

Food canning still remains by far the biggest single consumer of tinplate. The total production of all types of canned food rose from 432,000 tons in 1946 to 953,000 tons in 1956, with canned vegetables accounting for over half the total. The production of cans was doubled during this period. As Mr. Chivers points out, however, the annual consumption of canned foods per head of population is still only about 62 lb. in the U.K. as compared with about 125 lb. in the U.S.A., and with such relatively new lines as baby foods and canned beer continuing to grow in popularity, the demand for tinplate shows every sign of increasing. Nevertheless, the expansion of the British tinplate industry has been of such magnitude that for the first time since before the war it will be able not only to supply domestic demands, but to compete freely in the world tinplate markets.

Whether this situation will prevail for long seems doubtful. On the basis of figures from the Iron and Steel Board, Mr. Chivers concludes—in an article in the *Financial Times*—that by 1962 production will again fall short by some 300,000 tons of total demand (home and export). Since export prices stand at a useful premium over those obtainable on the home market, it appears that the welcome respite given to British manufacturers from tinplate worries may be short-lived.

Underfilled larders

FOOD technology in Poland, to judge from recent reports, is outstripping the supply of raw materials. Thus, we understand that, while considerably more cold storage warehouses have been built in Poland, the supply of most agricultural products is lower than before the war.

Just before the war there were only three cold storage warehouses in Poland with a total refrigerated surface of 18,000 sq. metres (193,000 sq. ft.) or 0·5 sq. metres (5·3 sq. ft.) of refrigerated space for every 1,000 inhabitants. We understand that there are now 19 warehouses, providing about 4 sq. metres (43 sq. ft.) for refrigerated space to every 1,000 inhabitants. Furthermore, the lowest temperatures obtainable before the war was −12°C. Today all freezer tunnels can reach −35°F. with a very intense air velocity. The old warehouses took from 55 to 70 hr. to freeze halves of meat which, under present conditions, could be done in 18 hr. However, meat is frozen in blocks rather than halves, in order to lessen weight losses, freezer burn and storage costs. Regular freezing temperatures are now at −0·4 to −9°F.

The average refrigerated warehouse covers about 8,000 sq. metres (86,000 sq. ft.), though new installations are being built in two sizes providing 5,000 and 7,000 sq. metres of refrigerated surface respectively (53,000 and 75,000 sq. ft.). The whole cold storage industry is state owned and is directed by the Cold Storage Association in Warsaw.

The shortcomings of Polish agriculture are recognised by the Poles themselves, and at a recent high-level conference it was confirmed that Polish agriculture is far behind the European standard. Poland, who once regularly had a grain surplus, now imports over 3 million tons of grain each year, and imports look like rising. One-third of all bread baked in Poland is made from imported wheat.

Better flour ahead

HOPE of improved flour for both bread and biscuit manufacture is given in the report of the Research Association of British Flour-Millers covering the period July, 1952, to December, 1956, which was published recently.

For good bread making, a strong flour is necessary; for many types of biscuit, a flour weaker than is usually produced is desirable. The strength of the flour depends on the gluten of the endosperm. Intensive work by the Research Association over the last two years has enabled a method to be devised of dividing flour into two fractions with different gluten contents, and therefore with different strengths.

The method is based on the separation of particles of different size, for it has been shown that particles of up to about 20μ are rich in protein and relatively poor in starch, whereas particles from 20 to 40μ in diameter are poorer in protein and richer in starch. Separation is effected by suspending the particles in a stream of air and subjecting them to centrifugal sedimentation. The smaller particles can then be used for enriching bread flours, whilst the large particles constitute a flour which is very suitable for the preparation of certain types of cakes and biscuits.

It has been found that the strength of biscuit flours can also be advantageously reduced by the use of a pure proteolytic enzyme preparation now on the market.

Another investigation which is described by the report as having given results of considerable practical importance is that which has been made into the effects of temperature in the milling of wheat. It has been found that, other things being equal, the yield of bran of a given finish (degree of freedom from attached endosperm) increases with the temperature of the milled grain, up to about 120°F. Correspondingly, the extent to which bran fragments occur among the endosperm particles is decreased. As a result, a better flour colour for a given rate of extraction can be achieved at higher temperatures; alternatively, a higher extraction rate can be achieved at a given colour level.

A good deal of work has also been done by the Research Association on the effects of the flour improver chlorine dioxide on the nutritive value of flour. Since nitrogen trichloride (agene) was shown to have a deleterious effect on the methionine of proteins, with the production of a substance which is poisonous to at least some species of animals, flour improvers as a class have been regarded with suspicion, and it is comforting to learn from the report that after exhaustive tests it would appear that chlorine dioxide can be given a "clean bill of health."

Insecticides and food flavour

THOUGH much is said about the toxic hazards of insecticide residues in foods, the somewhat separate subject of flavour taint has also been one of the "growing pains" of modern pest control. In the extreme sense, of course, it is not much of a service to mankind to save crops from pest attack at the cost of making them less palatable. This subject came to the fore when crude benezene hexachloride (BHC) was found to be such a good soil insecticide. Unhappily it tainted root crops with a musty flavour and odour, and much further work was required to develop a purer product—usually known today as lindane—when it was further found that the tainting effect was associated with isomers other than the active gamma isomer. Certainly with this refinement the tainting problem of BHC was greatly reduced.

The results of extensive tests, over 4 cropping seasons and involving twelve vegetable crops, have recently been reported in the U.S.A. (*J. Agric. and Food Chem.*, 1957, **5**, 523). The insecticides studied were all of the chlorinated hydrocarbon class—aldrin, dieldrin, endrin, chlordane, heptachlor, toxaphene, and lindane. Quite elaborate arrangements for tasting panels were made, based upon more than 100 men and women with widely differing backgrounds. The vegetables were evaluated in the forms in which they are most commonly eaten—raw, cooked, or canned. The possible effect of storage upon any flavour changes was also studied. However, before discussing any results, it should be made clear that when the test crops were grown, all the insecticides were applied, whether to the soil or the crop's foliage, at four times the normal rate of use in ordinary cropping practice.

The vegetables tested were beans, beet, cabbage, carrots, cucumber, onions, potatoes, pumpkin, radishes, rutabagas, squash, and tomatoes. The total number of flavour tests is not stated in the paper but it must have exceeded 300 and probably 350. Forty-five cases of significant flavour change due to insecticide treatment were detected, 7 of these in fact being desirable. So the measure of adverse effect is 38 in 300-350, or about 1 in 8 or 1 in 9. Lindane had the most pronounced effect, especially when vegetables were canned. Some vegetables were more susceptible than others, *e.g.* beet, pumpkin, rutabagas. Least susceptibility was shown by carrots, tomatoes, cabbage, beans, and cucumber. Storage had little influence—a flavour change detected before storage was unchanged after storage except in the case of canned onions in which an adverse flavour followed storage. Colour changes were sometimes associated with flavour changes, *e.g.*, canned beetroot had a black-red colour instead of a bright red colour as a result of endrin treatment. Flavour

effects were brought about by soil treaments slightly more than by foliage applications, but although this suggests greater assimilation through roots than leaves, no correlation between chemical analysis for residues and flavour changes could be established.

On the whole, these results are reassuring. At rates four times heavier than are used in practice, the insecticides did not bring a high incidence of flavour impairment. It is perhaps disappointing that lindane emerged as the most suspect, but the high rate of use may have exaggerated the comparison; detectable differences may be far easier to note at heavy usage rates than at the normal rate. Vegetables are not improved by pest attack, regardless of the loss in yield that is caused; and it does not seem that worse effects upon quality are likely to occur with any frequency when insecticides are used at their ordinary rates for pest control.

Thought for fuel

THE problem of making fuel and heat do the maximum work becomes more pressing with every increase in the already high prices of coal and oil. We shall all have to accept the prospect of dear fuel being a permanent feature of our economy. To escape the ruinous consequences of the wasteful use of these precious sources of energy, fuel efficiency must be rigorously practised in every factory and every home. "Fuel efficiency" must remain industry's watchword even when the nuclear power stations start to make a massive contribution to our electricity supplies. For it is unlikely that these stations will be able to do more than cope with the *additional* demands of our expanding economy for many years.

As the period of maximum demand upon fuel supplies approaches, it is appropriate for FOOD MANUFACTURE to switch the spotlight on economy and efficiency in their utilisation. We are fortunate to have a contribution from Sir Oliver Lyle, O.B.E., managing director of Tate and Lyle, Ltd., to open our fuel efficiency feature. Sir Oliver's wise and lucid observations will, we hope, give every food factory management cause to think hard about heat and power. The appeal of this article is enhanced because it is deliberately couched in terms of £. s. d.

Much of the fuel consumed by food factories is used in raising steam, which is used in turn chiefly for heating retorts, blanchers, boiling pans, etc. We have therefore devoted special attention in another article to those aspects of fuel economy which concern the raising of steam and its efficient use in food factories. It has been estimated that in the raising of steam alone an improvement of 15% on average is possible in British factories by relatively simple short-term steps.

Browning of dried vegetables

THE browning of many foodstuffs when they are exposed to high storage temperatures has long presented a problem to exporters, who have found that their products have a much-reduced storage life in hot countries. Some interesting Ministry of Agriculture and Food research seems to have provided a sound solution for storage-life problems with dehydrated vegetables in tropical climates. The formation of discoloring brown pigments through interactions between amino-acids and reducing sugars not only leads to bad appearance but it also has off-flavour effects; at tropical temperatures these interactions are initiated much more readily, but predicting the storage life of canned dried vegetables in tropical climates has hitherto been exceedingly difficult. Although the browning effect is stimulated by temperature, test observations need months rather than days, a cumbersome and indeed impractical requirement in checking factory products.

The usual testing temperature for tropical conditions is 37°C.—but the new research at Aberdeen has examined the possibility that the development of browning, though much speedier at higher temperatures, will follow the same pattern. For once in a way what might seem a dangerous over-simplification has produced a satisfactory answer. At 55°C. the development of browning per day is roughly equivalent to the development per month at 37°. The correlation of results for samples of the same dried vegetable products tested at these different temperatures was carried out by tasting panels for colour, flavour, and texture, and normal analytical methods were used.

The possibility that specific properties such as content of moisture or of sulphur dioxide may exert more influence upon browning at one temperature than at the other was also investigated, but samples of particular highness or lowness in this kind of feature still showed the same relationship, *i.e.* browning was roughly 28 times faster at 55° than at 37°. A far quicker factory test has therefore been made possible —the "shelf life" of the canned dried vegetables in tropical storage can be reasonably predicted to be about 28 times the shelf life found under test at 55°. It is necessary, however, for the test temperature to be accurately controlled; small variations from 55° can exert large influences upon the rate of browning.

It should be mentioned that this work has been carried out with dehydrated potato. Although earlier work has already indicated that a similar type of relationship exists for other dried vegetables, the generalisation should not be assumed with certainty until similarly thorough testing has been done for each dried vegetable also. The full paper may be studied in the *Journal of Science of Food and Agriculture*, 1957, **8**, 498.

Wiltshire Ways with Cheddar Cheese

CHEESE SPREADS AND "CHEDLETS" IN THE MAKING

Just over 30 years ago, Aplin and Barrett Ltd. introduced to the English market the practice of packaging processed cheese in triangular individual-sized portions. Much progress has been made in the intervening years, and FOOD MANUFACTURE recently visited the reorganised factory at Westbury, Wiltshire, where Aplin and Barrett's processed cheeses are made. An account is given below of the history, the personalities, and the technical skill behind the development of this factory.

FOR anyone who grew up between the wars, it is difficult to believe that many commodities now popular throughout the world have been developed within his own lifetime. One could give many examples; and none would be more apposite than that of processed cheese. The round cardboard box, complete with its six triangular portions, has become a standard pack for this product. Yet it is only a little over 30 years ago that Aplin and Barrett pioneered the development of this pack at their factory at Westbury, in Wiltshire. They introduced Chedlet in triangular portions in 1926. Prior to this processed cheese was developed and manufactured at the London factory. Despite the serious set-back which the trade received during the last war this type of pack has become so popular that it has made great inroads into all markets, and bids fair to become the widest selling of all cheese products.

The Westbury factory

The firm of Aplin and Barrett began in 1887, when a partnership was formed between James Shorland Aplin and William Henry Barrett. From their headquarters in Yeovil the firm has developed nationally throughout the intervening 70 years, and their St. Ivel cheese and other St. Ivel products have become known throughout the world. The Aplin family is now no longer actively engaged in the business, but Mr. E. S. Barrett, grandson of the original partner, is one of the three joint managing directors in charge of the company's operations. Since the end of the war Mr. Barrett has, in fact, directed the Westbury factory.

Above: **The cheese cleaning room, where the cloths are removed from the cheeses and the rind is scraped off.**

The Westbury factory handles all the firm's processed cheese products. It was opened in 1925 for the manufacture of processed Cheddar cheese, which was packaged at first in block form. In the following year, however, the triangular portions which were to prove so outstandingly popular

were introduced. Originally, these portions weighed 1 oz., and in some cases 1⅓ oz., but in 1928 they were supplemented by a pack of ½ oz. portions, intended essentially as dessert cheeses. So great was the demand for these products that in the same year the factory was compelled to introduce a night shift, and production continued to increase until it was interrupted by the war.

In post-war years, a portion of 7/12 oz., packed in the familiar circle of six pieces to give a box of 3½ oz. net weight, has proved to be the most popular size and has now become the standard pack.

The factory at Westbury welcomes many visitors, and one's first impression is of something vaguely familiar, seen now slightly out of context. Enlightenment soon follows. It was, in fact, used during the first world war for the assembly of aircraft and the distribution of stores. The property was bought by Aplin and Barrett, Ltd., in 1925, and has been converted by them into the food factory which it is today.

In 1937 a new block of offices was built, behind which it was hoped to develop a completely reorganised factory. The war intervened, however, and it was not until 1956 that the reorganisation could be carried out. This has now been completed, in consultation with Urwick, Orr and Partners, the industrial consultants, to bring the factory in line with modern production methods and standards of hygiene. Coincident with this reorganisation, Mr. I. J. Landon joined the company and took over the duties of manager at Westbury. Mr. Landon is no newcomer to processed cheese production, however, having spent over 25 years on this type of product.

Raw materials

The bulk of the cheese processed today is of the Cheddar type, and *Chedlet* still constitutes a large part of the factory's products. The company owns farms and dairies throughout the region, including creameries at Yeovil, Wellington and Frome, in Somerset, and Tiverton in Devon, at which cheeses are made for use at Westbury. Although these local creameries cannot fulfil the total demand of the factory, they nevertheless provide the basis of English Cheddar cheese on which the processed cheese is largely formulated.

The cheeses are received at the factory from the outlying creameries and are immediately placed in a cool store, held at around 50°F., until they are sufficiently mature for use. The maturation period varies with several factors, including the time of year and the feed of the cattle, but a period of between three and six months is usually allowed. In the early stages of maturation, the cheeses are turned every other day to ensure even exposure of the surfaces to the air, and this is continued at less frequent intervals until the cheeses are taken out for use.

Any idea that second-grade materials can be used in the manufacture of processed cheese is quickly dispelled. The cheeses are graded by independent graders from the Creamery Proprietors' Association, and only selected cheeses are used in the factory. In addition, laboratory checks of fat, moisture content, salt and acidity are made on the incoming batches of cheeses, as an additional safeguard against faulty material.

For the preparation of processed cheese, a blend is made of cheeses of the correct stage of maturity to give the desired body and flavour to the finished product, and cheeses are withdrawn from the cold store accordingly. As well as English Cheddar, Scottish Cheddar and Commonwealth cheeses of this type are used on occasion to give a blend with the correct characteristics.

Despite the many advances which food science has made, cheesemaking — even processed cheesemaking — remains very much an art, and the selection of the final blend is a task needing skill and long experience in the trade.

The production line

After entering the factory, the cheeses are first soaked in lukewarm water to soften the wrapping cloth, which is then removed. The rind is next scraped off with knives, and any spots of mould which has penetrated the cloth are carefully removed. The cleaned

The cooking section, where the ground cheese is processed. The stainless steel pans are equipped with steam jackets and high speed agitators.

cheeses are passed on a conveyor to the grinding room, where batches of the correct blend are weighed out. These are then passed through granite rollers, which reduce the cheese to a stiff paste. This is in turn passed to the cooking room, for final processing.

It is at this next stage that the cheese undergoes the main modification of its properties, and becomes the processed article. The ground cheese is filled in 100 lb. lots into shallow, steam-jacketed pans, equipped with agitators that operate through the tightly closed covers of the pans. The correct emulsifying salts are added at this stage, and the mixture is then pasteurised at a high temperature for the appropriate time. The cheese melts to a highly viscous liquid, but the action of the emulsifying salts and the stirrer prevents the separation of the fatty and aqueous components, so that a completely homogeneous product is obtained. The emulsifying salts also contribute to a marked degree to the securing of the correct texture in the finished product.

When processing is complete, the pans are opened and the liquid cheese is transferred to the bowls of the filling machines, ready for packaging. These machines are ingenious in design, though the principle on which they work has now been applied to the packaging of many commodities of similar consistency. Coated aluminium foil is fed from a roll to a cutting device, which stamps out pieces of the correct proportions at the rate of 80/min. These are then pressed into a triangular forming-cavity recessed in the surface of a revolving table. A measured quantity of cheese is forced into the foil, the edges are lapped over, and the triangular covering piece, which has been stamped from a second roll of foil, is then automatically applied, and is crimped and heat-sealed into position. Finally, the wrapped sections are removed from the filler by a moving arm, which arranges them on a small revolving table into the hexagonal assembly which they occupy in the finished pack. Boxes are then fitted by hand, and labelled lids are applied to complete the operation. The labels of the individual sections are applied to the original foil, as it is stamped out, by devices which vary slightly with the type of machine. The filling machines are of Continental design.

The filled boxes are packed in cartons of twelve, which are in turn packed in lots of four into heavier fibreboard cartons for dispatch.

A close up of one of the filling and packaging machines. The only manual operation is the filling of the wrapped portions into the circular boxes.

A general view of the filling room. The plastic ceiling covering the processing areas can be seen in this photograph.

Cheese spreads

Although St. Ivel *Chedlet* remains one of the factory's most popular products, Aplin and Barrett have achieved considerable success with cheese spreads. The most popular pack is one containing an assortment of flavours

marketed under the name of *St. Ivel Family Favourites*.

St. Ivel Family Favourites is an assortment of 6 varieties, including St. Ivel Chedlet Cheese and St. Ivel Cheese and Tomato Spread. The assortment varies to meet regional preferences, and from time to time new varieties are substituted to cater for changing tastes. Most of the varieties included in St. Ivel Family Favourites are also available in glass jars to suit those who want larger quantities.

The manufacture of cheese spreads involves essentially the same process as that used for the production of processed cheese, though the products vary considerably in respect of textural requirements. A processed cheese is required to slice, often quite thinly, without crumbling or otherwise collapsing. A spread, on the other hand, must do just that, and it must in consequence be softer and more liquid in texture. Much of the secret of obtaining the correct consistency in each case depends on the use of correct emulsifiers, and these are chosen with care for the particular type of product being prepared. Other substances, such as non-fat milk solids, and butter, are also used to provide the necessary flavour and texture in cheese spreads. In the case of spreads flavoured with tomato and celery, these substances are added in concentrated form after pre-sterilisation.

There is a tendency on the part of the general public to show an increasing preference for mild-flavoured foods which is one of considerable general interest to food manufacturers, and it brought forth some interesting remarks from Mr. H. B. Hawley, the Director of Research of Aplin and Barrett, Ltd., and a recent contributor to FOOD MANUFACTURE. Mr. Hawley confirmed that this tendency, which has emerged so strongly since the war, and which has affected manufacturers of products ranging from pickles and sauces to bacon and ham, is equally noticeable in the dairy industry, where clotted cream has now lost much of its appeal and strong cheeses no longer enjoy the favour of the general public. Indeed, the growing popularity of processed cheese is undoubtedly linked to its having a generally milder flavour than the fully-matured, unprocessed product.

There are, of course, other cogent reasons for the increasing sales of processed cheese. One of them is the obvious saving effected by the purchase of cheese in this form. The cheese is rindless, and wastage is further prevented when it is packed in individual-sized portions. Again, the cheese will keep much longer when wrapped in foil, without being subject to the unpleasant drying-out to which unpackaged cheese is prone. The keeping quality is also greatly improved by the fact that the maturation of the cheese is arrested by the processing procedure—a fact which also contributes appreciably to the mildness and uniformity of flavour.

As has again been found with many other foods, the question of uniformity is becoming more and more important, and repeat orders are captured by those products which vary least in taste and quality. It is obviously much easier to achieve this standardisation with processed cheese than with the natural article, since cheeses of varying characteristics can be blended in its preparation. At the Westbury factory, every effort is made to eliminate variations in the quality of the various products. As well as the laboratory tests on the incoming raw cheeses already mentioned, tests are made on all other raw materials such as emulsifying salts, tomato purée, spices, etc. In addition, samples are drawn periodically from the production line for testing, and early each day a conference is held by senior members of the staff on samples of the previous day's production.

A careful watch is also kept on sanitary conditions within the plant. A very high degree of hygiene must be maintained throughout the manufacture of processed cheese, and appreciation of this need was very much in evidence at Westbury. The factory manager, Mr. Landon, quite clearly holds strong views on the subject. A great deal of effort has been put into securing a completely hygienic process, and at the end of the day's production the equipment is washed down in a four-stage process which involves detergent, sterilising and clear-water washes. In addition, a careful bacteriological check is kept on the product and on the factory air. The equipment is also frequently checked for bacterial build up, and all machine parts in contact with the cheese are constructed of stainless steel.

The quite elaborate steps which are taken to keep the plant free from rodent and insect pests can plainly be seen. Doors and windows are equipped with fly screens, and all incoming air is filtered. Attention is also given to the surrounds of the factory, the grass being kept short and sprayed periodically with insecticides and insect repellents.

During the recent reorganisation of the production line, opportunity was taken to place a ceiling of transparent plastic material over the whole of the production area. This can clearly be seen in several of the accompanying photographs. As well as reducing the dust hazard, this ceiling contributes greatly to the light and sanitary appearance of the plant. The wide use of glass in separating the various processing areas also gives a generally light and airy appearance.

Disposal of waste

As in many food factories, the disposal of waste water, contaminated as it is with organic matter, presents a problem at Westbury, but the factory is fortunate in having its own sewage plant. Effluent water from the factory passes through a settling tank, and then through two filter beds, placed in series. After flowing over a weir from a final tank the water can then be run to waste, its biological oxygen demand having been reduced to a level satisfactory to the health authorities.

Radiation Processing of Foods—1

A Commentary on Present Research

By R. S. Hannan,* M.A., Ph.D., and Margaret J. Thornley,* B.Sc., Ph.D.

The treatment of food with "atomic" radiations promises certain basic advantages over the traditional methods of heat processing, and research in the U.S.A. has reached the stage where an irradiation unit capable of treating large quantities of food is being constructed. Work has also been in progress in Britain for several years, and this article summarises the present position as seen by workers in one of the main British research groups.

VARIOUS suggestions were made during pre-war years that ionising radiations might be used for preserving foods, including a French patent as far back as 1929. But only since 1947 has the tempo of this work quickened. Many workers are now engaged in research, a vast literature has accumulated, and predictions of widespread use have been made.

It would be timely, at the end of this decade of intensive research, to present a summary of current views, but this is not at all easy. Apart from other factors there is the basic difficulty that this is a subject which tends, unfortunately, to arouse extreme opinions. There is no lack of individuals ready to reject such a process as impractical or undesirable, frequently on mistaken grounds, while on the other hand there are enthusiasts of all degrees, sometimes speculating far beyond established facts.

Our intention in this paper is to present the more pertinent of these facts with a minimum of speculation. We feel that they will show that (1) the subject is still in a research phase; (2) it is worth pursuing objectively and is beginning to show signs of promise for practical application; (3) such application will not displace existing methods of processing or, in the broadest sense of the word, revolutionise the food industry.

The references quoted are only a representative selection from the many available. The review articles indicated[1-9] will provide further reference.

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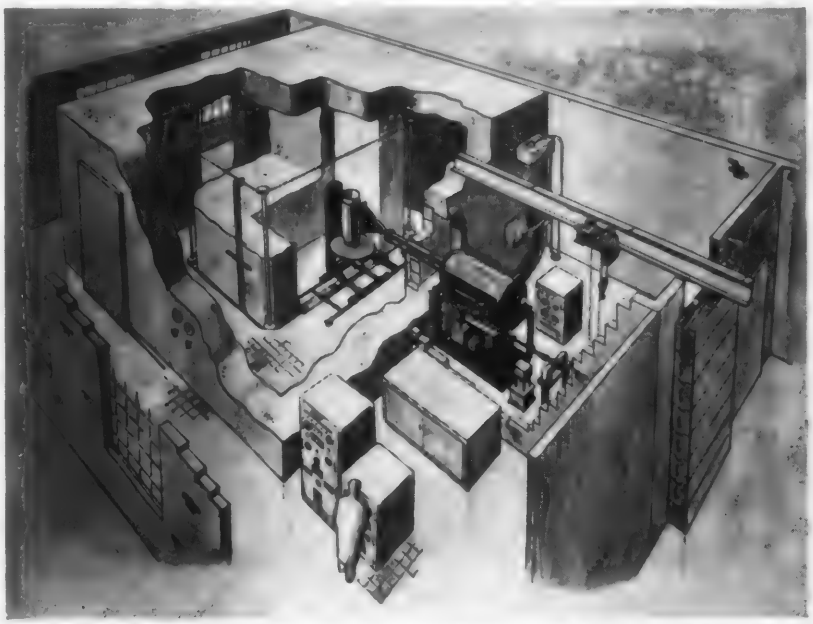

Fig. 1. A 4 MeV linear accelerator mounted horizontally in a typical irradiation chamber (*reproduced by courtesy of Metropolitan Vickers Electrical Co., Ltd.*).

PHYSICAL PRINCIPLES

What are ionising radiations?

First let us be quite certain which radiations are concerned. Their characteristic property is to impart sufficient energy to cause ejection of an orbital electron from an atom or molecule. The radiations of practical significance are *gamma rays* and *X-rays*, both electromagnetic waves, and *cathode rays* and *beta rays*, both consisting of streams of fast electrons. Gamma and beta rays are obtained from radioactive sources: X-rays and cathode rays from electrical devices. (It should be noted, incidentally, that ultraviolet, infra-red, radio and ultrasonic waves do not cause ionisations and are not in this category.)

The ions produced by electron ejection are highly unstable and produce a variety of effects. Those which concern us most are chemical changes, often through the action of free radicals, and biological changes of various types. The process of cell reproduction is particularly sensitive, and its inactivation is the basis of most of the applications which have been investigated.

All the radiations which we are considering produce such chemical

and biological effects and, in our experience, are effectively similar for food processing except for important differences in penetration. These can be seen in Table 1. Gamma rays and X-rays of very high energy are the most penetrating and could be used for treating considerable thicknesses of food. Soft X-rays, beta rays and low energy cathode rays on the other hand would only be useful for special applications such as treating thin samples or the surface layers of large samples.

An important feature of the radiations which would be used for food processing is that they do not cause the food to become significantly radioactive. Radioactivity is induced by changes in the *nucleus* of an atom and calls for a higher order of energy again. A number of criticisms of the process have been based on misguided views on this subject.

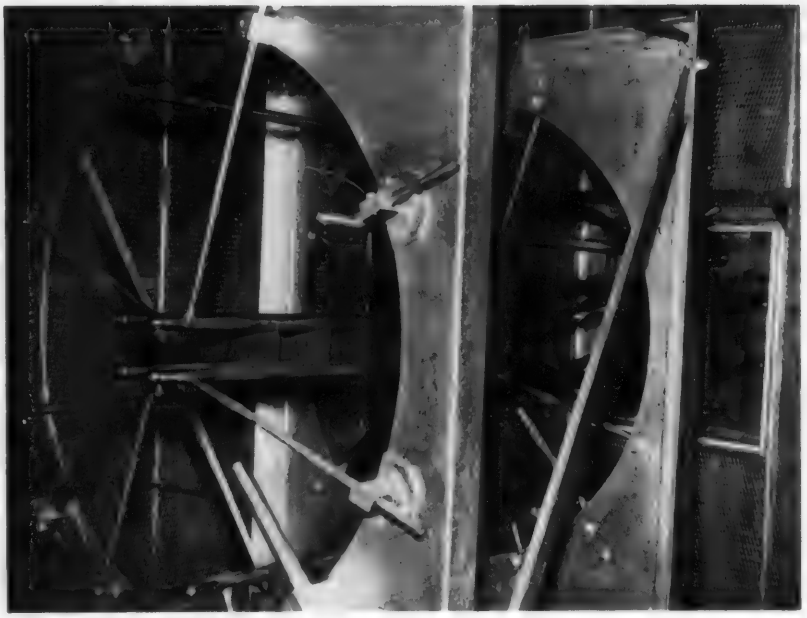

Fig. 2. A 10,000 curie Cobalt 60 source at the Wantage Radiation Laboratory. The source tubes are arranged in an octagonal array and the spacing can be adjusted as required. For loading the source the radio-active material is withdrawn into the concrete shielding at the right of the picture (*reproduced by courtesy of the Atomic Energy Research Establishment*).

How is radiation measured?

Two types of units are in common use. The first is a measure, in *electron-volts*, of the intrinsic energy of each quantum or particle of the radiation. The significance is seen most easily with electrons where, in effect, it indicates the velocity of each particle and hence, as already seen in Table 1, its penetration. The energy which can be considered for food processing is probably limited to about 10 MeV if induced radioactivity is to be avoided.

The second unit measures the *quantity* of *radiation energy* absorbed by a medium in any given time and is known, by the medical term, as the *dose*. The *rad* is the international unit most suitable for general use in this field and corresponds to an absorption of 100 ergs./g. of material. Thus 1 million rads raises the temperature of water by 2·4°C. or 4·3°F. (10 joules). It will be noted that this unit is a quantity of energy per unit volume and there is no need, in any individual case, to specify the volume treated. The dose will, in fact, vary at different points of a large mass of irradiated material. Readers may be familiar with the *rep* as a unit of dose, but various workers have used differing definitions and the unit is, in consequence, falling into disuse.

Methods of producing the radiations

Irradiation devices which might be used for large-scale processing are of two main types, electrical and radioactive.

The most suitable electrical machine for general purpose food work, where appreciable penetration is likely to be demanded, is the linear accelerator generating an electron beam.[10, 11] British designs have been particularly successful and several linear accelerators produced by two firms in Britain have been supplied for medical work during the last few years. Energies up to the requisite 10 MeV are readily obtained, permitting the treatment of samples up to about 3 in. thick, and ample electrical power can be delivered for the treatment of food in quantity. The power output of most of the present commercial models is 0·5 to 1 kw., *i.e.* sufficient to treat about 1 ton of food per hour with a "pasteurising" dose, and higher-power models are under development. Food samples would be carried through the electron beam on a travelling belt and each would be irradiated

Table I. Useful penetrations achieved with different ionising radiations using typical irradiation sources
(The dose received at any point will exceed 60% of that at points of maximum intensity)

		Useful penetration (inches)	
		Irradiating from one side	*Irradiating from both sides*
γ rays	Cobalt 60	4·0	16·0
X-rays	50 keV	< 0·05	ca 0·2
	10 MeV	5·0	24·0
Cathode rays	1 MeV	ca 0·1	ca 0·3
	5 MeV	0·7	1·7
	10 MeV	1·5	3·4
β rays	Strontium 90	< 0·05	ca 0·1

in a matter of seconds. Fig. 1 shows the type of installation, including concrete protection walls, which is likely to be required.

A source of quite different nature is the radioactive waste product of nuclear power stations.[3, 4, 11] The amounts of such material which will be produced in Britain during the next ten years would be sufficient for treating considerable quantities of food. Most immediately available is the radiation from used nuclear reactor fuel rods. These are normally withdrawn after a given period of operation and can be used, for at least several weeks, as convenient sources of gamma radiation. The intensity of the radiation decays rapidly, however, and this would complicate use for manufacturing processes. A preferred source for industrial use would be obtained by chemical extraction of the nuclear fission products in the fuel rod to give the isotope, Cæsium 137. This emits penetrating gamma radiation and has the very long half life of over 30 years. Construction of elaborate extraction plant will be necessary, however, before this could be available in quantity. Radiation facilities using these and similar sources have been constructed by the Atomic Energy Research Establishment, Harwell, at their new Wantage Radiation Laboratory, and Fig. 2 shows one of these sources.

Protection of operators from the lethal radiations is a basic requirement with all of the high energy radiations, and the concrete shielding required for a large source would make it essentially static. Mobile installations would be feasible with relatively small sources, however, and several designs have been proposed.

Treatment of foods

The methods of food processing which have been investigated depend mainly on the inactivation of micro-organisms or insects, and in general the larger the organisms the lower the dose required. Unfortunately, the advantageous biological effects are only part of the picture. The chemical changes which are produced in the foods, although small in total amount, are usually of a nature which detracts from the quality. For example, unusual odours and flavours are often produced, the appearance of meat products can be changed and the firm texture of fruits and vegetables can be lost. The main practical problem is to seek a suitable compromise treatment which gives a large enough biological effect to be commercially useful, but damage which is so slight that it can be ignored.

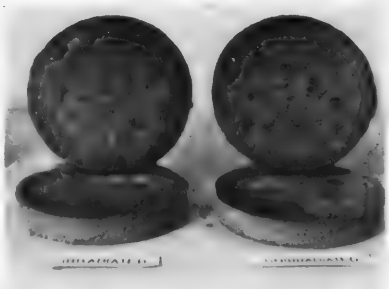

Fig. 3. Sponge cakes prepared from frozen whole egg pulp and from similar egg pulp irradiated with 500,000 rads of Cobalt 60 gamma rays while still frozen. There was no significant difference in volume or general appearance between the two types of cake.

This compromise is much nearer realisation with some processes than others, and those which are showing promise for commercial use will be discussed first.

PROMISING APPLICATIONS

Disinfestation

Approximately 20,000 rads are usually sufficient to prevent development of insect eggs and larvæ and sterilise the adults, so that a whole population dies out in one generation.[12, 13] Such a dose has no apparent effect on the quality of many products which would be of interest for disinfestation, such as grain and dry packaged foods of various types, but some are affected and each must be examined individually before it is assumed to be suitable for treatment.

The penetration even of gamma rays is not enough for treatment of grain, etc., in bulk storage, and although it would be possible to irradiate while filling the container, prevention of reinfestation would be difficult. Foodstuffs which can be treated after enclosing in insect-proof packages, therefore, offer more positive advantages for this type of treatment.

Processes of direct public health interest

Certain processes are particularly attractive since they offer the clear advantage of inactivating food-borne organisms which can cause serious human illness.

Trichinella spiralis in pork can be inactivated with a dose of about 20,000 rads,[14] and this has little apparent effect on the pork other than to produce a slight change in odour. In some countries this parasite, the cause of human trichinosis, constitutes a serious problem, but it is encountered only infrequently in Britain. A similar technique might be applied to other parasites in meat products, however.

The presence of *Salmonellæ* in egg products is a cause of much present concern, particularly in frozen products imported into Britain. Extensive studies at the Massachusetts Institute of Technology[15, 16] have shown that 300,000 rads inactivates these organisms in liquid whole egg pulp or egg white. In dried egg white the organisms were protected to some extent and up to 1,000,000 rads were necessary. In our laboratory we are working with frozen whole egg, and have been able to inactivate the *Salmonellæ* with 500,000 rads without thawing.[17] The baking properties were unaffected (Fig. 3), except for a very slight odour and flavour in sponge cakes prepared from the treated egg. Among the advantages of a successful process, if it can be developed, is that it could be carried out with commercial size cans of egg probably up to 40 lb. in weight.

All harmful organisms cannot be inactivated with moderate doses, however. Spore-forming bacteria are much more resistant

than the *Salmonellæ*, for example, while viruses in general are even more resistant.

In Part 2 of this article, which will appear later, an account will be given of other promising applications of irradiation in food processing.

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Phage particles entering and multiplying within bacterial cells.

Phage-resistant Medium for Cheese Starters

ONE of the chief troubles encountered in the production of hard-curd cheeses of the Cheddar and Cheshire type is the occurrence of "slow" cheeses. In the production of cheeses of this type, it is essential to obtain steady production of lactic acid from the lactose of the milk by the cheese starter organism, and slow cheeses result from an interference with, and in some cases a complete arresting of, this reaction. The chief cause of this is bacteriophage, a virus-like substance which is parasitic on the lactic acid bacteria of the starter culture.

Fisons Milk Products, Ltd., are now manufacturing on a commercial scale a phage-resistant medium, Cockade P.R.M., which is said to give complete protection against bacteriophage troubles. The medium was discovered by Dr. Bruno Reiter, an Austrian scientist working for the firm in this country, and was first announced at the 1956 International Dairy Congress, in Rome. It has been widely tested in the U.K., New Zealand, Australia and the U.S.A. It is claimed that up to 5% of the world's cheese production is spoilt each year by phage attacks, and that this spoilage can be almost completely eliminated by the use of the new medium.

The medium itself is a calcium-free milk product in powder form, which must be reconstituted in calcium-free water. It has been found that the bacteriophage, which is composed largely of nucleoprotein, penetrates the outer membrane of the bacterium on which it is parasitic by means of an enzyme. The bacterial cell and the bacteriophage each carry a negative charge at the point of attachment, so that they are naturally mutually repulsive. The divalent calcium ion, carrying a double positive charge, is able, however, to bring the two active foci into intimate contact, thus allowing the phage to penetrate the bacterial cell. Removal of the calcium ions is therefore effective in preventing the phage attacks. The lactic acid bacteria are consequently able to multiply rapidly in the medium, no matter how heavily the original inoculum was contaminated with phage. The phage, on the other hand, denied access to its host, without which it is unable to multiply, dies out. When the starter culture is subsequently added to the bulk of the milk, the favourable environment provided by the phage-resistant medium has allowed the starter organism to become so well established that the presence of calcium and phage contamination in the milk can no longer significantly affect its growth and acidifying abilities.

Fisons Milk Products, Ltd., are anxious to see their new medium launched under correct supervision, and they are themselves willing to supervise its adoption in cheese factories, and to familiarise manufacturers with its use. They are also prepared to loan water-softening equipment and the turbo stirrer necessary for reconstituting the medium to factories which are not adequately equipped with these necessities.

As well as providing the new starter medium, which will shortly be available, and the technical information useful for its successful adoption, Fisons will also provide on application suitable starter cultures. Selection can be made from 30 single-strain starters and 20 mixed starters which have been proved satisfactory in use.

Thinking Ahead on FUEL ECONOMY

By Sir Oliver Lyle,* O.B.E.

No one has given more commonsense advice on fuel saving than the distinguished author of this article. The high standard of fuel efficiency reached by Sir Oliver Lyle's own great company impressively demonstrates how effectively he practises what he preaches. Here is the essence of his thinking on a matter that acutely affects the profits of all food companies.

IT is probably fair to say that fuel-saving propositions meet with more managerial and directorial resistance than labour-saving propositions and output-increase propositions. Why is this? Is it not simply because the fuel-saving proposition is more difficult to understand and is often put forward couched in technical jargon? The labour-saving proposition is so simple. "If we spend so-and-so on this machine we save 2 men or £1,000 a year." Or, "If we spend so much we get an output increase of such-and-such."

The fuel saving proposition is usually much more complex. "If we do so-and-so we will relieve the load on the boilers, improve our CO_2, reduce maintenance of furnace arches, save safety-valve blows, get a steady steam pressure." Now that all sounds rather nebulous. It is most important that engineers and technologists be encouraged to translate these benefits into £ s. d., the common denominator that anyone can grasp instantly. Thermal units, kilowatts, pounds of steam, all have their rate of exchange into £ s. d.

Most fuel savers are great money savers, and fuel saving almost always brings with it many consequential advantages. We have all had experience of the optimism of engineers. The engineer says, "The job will cost £3,000 and be done in 8 months." Actually it costs £4,000 and takes a year. But if the engineer says it will save 7 tons of coal a week, the saving is not just the cost of coal. There will be the following consequential advantages:

Less coal to handle.

The stock heap represents a longer time.

Less ashes to handle.

If the saving is on steam, we also get the following:

Less boiler maintenance.

Less water to buy.

Less water to soften.

Increased boiler capacity.

Increased feed pump capacity, etc.

* Managing Director, Tate and Lyle, Ltd.

FUEL EFFICIENCY

A "Food Manufacture" Survey

Is fuel efficiency worth the time and money required to achieve it?

Is it worth the trouble?

What can be done to increase efficiency in existing plants?

What equipment is available to help reduce fuel consumption?

The answer to these and similar questions is to be found on the following twelve pages in which "Food Manufacture" focuses attention on matters of importance to all users of fuel and power.

In addition to the article by Sir Oliver Lyle the following articles appear:

The Efficient Generation of Steam, p 463.

Aids to Fuel Efficiency, p 466.

Making the Most of Fuel and Power, p 471.

Money savings

Before we consider the kind of thinking ahead that we should do, may I try to ram home the great money advantage of fuel-saving propositions? Here are the results, in money, of the reorganisation with which I was associated in the sugar refinery whose operations I have the honour to control.

We had an old obsolete plant. Its maintenance was high. It turned out a product of indifferent quality. It had to be renewed. We did a great deal of thinking, and we organised a long programme of renewal and rearrangement.

The results have been a great simplification of the process plant, a great improvement in quality, a reduction in maintenance, a reduction in labour. These combined benefits would have justified the whole proposition in themselves. But we also got a great saving in coal—we very nearly halved our coal consumption. Before the reorganisation started

we burnt 25 tons of coal per 100 tons of sugar. After the reorganisation we burnt 13 tons per 100 tons of sugar. We saved 12 tons of coal per 100 tons of sugar. Let me tell you what that means in money today. In this refinery we refine 12,000 tons of sugar a week. We are therefore saving 1,440 tons of coal a week. We pay 100s. a ton for coal, so we are saving £370,000 a year.

Now you can say, "That just shows how bad you were." We can reply, "It does indeed, but we were never as bad as most factories are today." Now that coal saving was only possible by thinking ahead.

How does thinking ahead help? At present one hears on all sides, "We cannot do plant renewals or alterations to save fuel. We must spend our money on increased production. We haven't got the money for fuel saving." All that is true, up to a point, but we are all always renewing some, at least, of our obsolete or worn-out plant. Are we thinking ahead to make sure that the new plant will be the right plant in 5 or 10 years time?

Any honest factory engineer will tell you that the easiest way to renew plant is to say, "Same again with knobs on." Now that is not the way to do it at all. If "the same again" is installed it may do all right for a few years, but it will almost certainly not be all right in 10 years, when other plant is installed.

There are thousands of factories in the country, including many food factories, which want a lot of hot water first thing in the morning, and very little in the afternoon. They are planning an increase in output, let us say. The first thing they do, in 9 cases out of 10, is to buy more boiler capacity, so that the great morning peak can be met. Now in almost all cases, a much better choice would have been a large, heavily lagged hot water tank. When times were slack in the boiler-house in the afternoon, water could be heated and put in the tank for use next morning. Water near boiling point in a large well-lagged tank will only lose 5-6°F. overnight. The following advantages emerge: the hot water tank is cheaper than a boiler; it is not a pressure vessel and needs no insurance or annual survey; the boiler load can now be kept almost constant, with a great improvement in combustion efficiency; safety valve blows can be eliminated; output in the morning can be greatly improved; use can be made of waste heat to do part of the water heating.

What is all this worth? It can only be truly valued in a specific case, but we can give some indications.

Constant firing rate on a steadily loaded boiler can result in an economy of up to 20% in coal compared to the conditions when the fireman's whole attention is devoted to chasing peaks and valleys instead of being concentrated on combustion.

Safety valve blows are generally much more wasteful than is usually believed.

Steady steam pressure and a ready supply of hot water greatly improve quality of processing, increase output, and remove irritation and frustration in boiler-house and process staffs.

It is no exaggeration to say that a really big hot water storage tank can in many cases save between one-fifth and one-quarter of the coal as well as giving increase in output and better quality.

Now that is an example of quite a tiny bit of thinking, but it points the way. Do not blindly do the obvious until other simple, less-obvious things have been explored.

Finding bogey fuel consumption

If you walk round a golf links and think, you can decide on bogey for the course. Similarly, by imaginative thinking, it is equally possible to find the bogey fuel consumption for an industry or an individual factory. Factory bogey must be reasonable perfection. It must not simply be the best that can be done with existing plant and methods. It means the best that can be done with plant that may not yet be obtainable, by methods that perhaps have not yet been perfected, looking ahead at least 10 years. Then, as plant calls from time to time for renewal the plant can be such that it conforms to bogey. This may often mean that the new scratch plant may be too small for an 18 handicap factory, so that some of the old plant must be coaxed along for a few more years until other plant fits in with the bogey plan.

In the sugar refining industry we know our bogey. It is 9½ tons of coal per 100 tons of sugar. Our best player goes round in 13 tons and some of the rabbits in about 20 tons. Our best player hopes to play from scratch in about five years time. Then it will be time to think up a new bogey.

Now this good performance has not been reached by installing fuel-saving plant for its own sake (or only in a few small instances). It has been achieved by establishing bogey and by deciding what the plant should be to reach bogey, and by putting in the right plant as each piece of plant was due for renewal.

So here is the answer to those who say that fuel saving cannot be done because it entails capital expense. We are all doing some capital expenditure in replacements and renewals. If we think ahead we shall gradually get the right plant which, as well as being up to date, will give us perpetual and lucrative fuel saving.

It means that factories must think ahead for 5, 10, 15 years. Is it an exaggeration to say that most factories only look ahead 2 or 3 years as regards heat-using plant? Why not emulate the farmer who regularly thinks ahead 4 or 5 years, or the fruit farmer who thinks ahead 10 to 15 years? If we study the farmers' methods we will discover many interesting things, including, for example, why he always puts his gate at the muddiest point of the field.

Let us never forget that all the heat we use in our factories is thrown away eventually; we none of us probably sell hot products. So let us always use the smallest amount of this valuable stuff, heat, when we know it is all going to be lost.

THE EFFICIENT GENERATION OF STEAM

Many full-length books have been devoted to this subject, and experts have examined it from every aspect. Yet the fact remains that in many factories the generation of steam is carried out with inadequate equipment run on uneconomic lines. Here is a summary of some of the salient features of the problem, and of the methods available for effecting economies in the use of fuel in steam raising.

IN the United Kingdom coal still remains the basic fuel of most steam raising plants. It is therefore assumed, for the purpose of this review, that solid fuel is being burned, and special considerations relevant to oil-burning furnaces, etc., are not discussed. In many instances, of course, problems of economy and efficient operation are common to all types of equipment.

The primary unit in all steam raising plant is of course the boiler, and choice of the correct type of boiler is fundamental to subsequent correct operation of the plant. It is important, therefore, that the respective merits of the various kinds of boiler available should be clearly understood.

Courtesy of N.I.F.E.S

A modern boiler room equipped with an instrument panel, which the stoker can be seen consulting.

Types of boiler

Lancashire boilers. In Britain, most of the steam used in all industries other than those concerned primarily with the generation of electricity is generated in shell boilers of the Lancashire type. It has recently been estimated[1] that there are still some 120,000 of these in use. It is quite obvious that any piece of equipment which has found such wide-scale use must generally be considered satisfactory, but great as has been the service of the Lancashire boiler in the past, it is interesting to review its claims in the light of modern technical knowledge and the current fuel situation.

In the first place, the rugged construction and general simplicity of operation of this type of boiler, although in itself an asset, has long led to a good deal of overloading and misusage, so that although the demands of the user for steam have been met, this has been done only at the cost of a lamentably low level of efficiency.

Again, it is often claimed that the shell boiler has a high thermal storage capacity and is therefore capable of meeting wide variations in steam demand; but this claim must be taken with some reserve. This type of boiler is essentially slow steaming and does not react readily to changes in the rate of steam demand. A fall in pressure occasioned by a peak demand may therefore be remedied only slowly, often with the result of costly stoppages in the plant. This is reflected particularly in the time required to raise steam from cold or banked conditions, which makes the shell boiler particularly unsuitable for intermittent operations.

A further claim made by the advocates of shell-type boilers is that they are not sensitive to the quality of feed water, and that where water conditioning is required it can be done internally. This is to some extent true, but internal treatment of water has its own hazards, unless carried out under careful supervision, and the quality of water is probably no less important to the securing of high efficiency in this type of boiler than in any other. Moreover, it is becoming more frequent practice to fit Galloway

tubes, and in some cases a battery of fire tubes beyond the combustion chamber, in modern shell boilers (Galloway, Super-Lancashire, Super-Cornish, etc.), and the use of these adaptations can give rise to high maintenance costs if water of the right type is not used.

Economic (fire-tube) boilers. This type of boiler is coming into increasing use, and it has several advantages over boilers of the simple shell type. Like them, it is limited to pressures of about 250 p.s.i., but this is adequate for the work done in food factories, particularly as we are concerned here chiefly with the use of heating steam. Fire-tube boilers have a lower steam-storage space than the Lancashire boiler, but a considerably higher steaming rate, and they respond well to changes in load. Automatic appliances are available which allow them to be cleaned on the gas side without shut-down. They have a very high operating efficiency, being much less affected by excess air and change in evaporation rate than the Lancashire boiler, owing to the high proportion of convection heating surface located in the hot zone of the boiler.

Tube boilers of this type are of course very sensitive to feed-water quality, and care must be exercised in its control. They also show a marked tendency to prime, resulting in the carrying over of boiler water with the steam. Owing to the resistance of the tubes to gas flow, they often require a forced draught.[1]

In the modern Super-Economic boiler, the gases make three passes through the boiler, and this improved type can give excellent service when controlled by skilled attendants, especially if provided with automatic fuel, air and water controls.

Water-tube boilers. The design of water-tube boilers is extremely flexible, so that efficient units can be made for the consumption of any and every type of fuel. There is almost no limit to the size of the units obtainable, or to the steam pressures which can be achieved. They are very suitable for use where steam is to be generated at high pressure and used to perform mechanical work prior to its use for heating purposes. Operating costs are relatively low, because the unit capacity is high, though the initial capital expenses and the cost of providing stand-by is higher than with other boilers. A marked advantage of water-tube boilers in some parts of the world is that no individual part of the boiler is unduly bulky or heavy, so that they can be transported to and erected on sites which would be difficult or impossible of access with shell boilers of equivalent capacity.

Vertical boilers. Where steam demands are relatively small and more or less intermittent, a vertical boiler can often usefully be installed. Boilers of this type may be of either the fire-tube or the water-tube kind, and those of modern design often have inclined or horizontal tubes. Given good water and careful upkeep, boilers of this type will give efficient service over long periods.

Firing appliances

It has been estimated that 22 million tons of coal per year are still being fired by hand in British boiler plants, that the conversion of these plants to mechanical firing would effect a large saving in fuel, and that the capital cost involved could be recouped in less than twelve months.[1] In general, it may be said that hand firing is efficient on boilers having a fuel consumption of 400 lb.-hr. (600 lb./hr. in the case of coke), though with highly bituminous coals and with anthracite the figure may be lower.[2] At rates of firing above these, the introduction of mechanical stoking leads in almost all cases to a worthwhile increase in fuel efficiency.

There are on the market many types of mechanical firing appliances—too many, in the eyes of some authorities—and it is not possible to describe them in detail here. They can be divided into two main classes—viz. those which throw fuel into the furnace and those which convey it in. The former aim to emulate the highest standards of hand stoking, and to eliminate the human variations attendant on this method of firing. In the second type, of which the chain grate stoker is a good example, the whole grate is constructed as a continuous chain, which moves slowly through the combustion chamber, introducing new fuel and discharging spent fuel as it goes. Stokers of this type are now available for quite small boilers, and they have been found suitable for use with a wide variety of fuels, including fine coal and coals with a high ash content.

Economisers

Efficient as may be the design of modern boilers, the heat exchange between hot gases and the steel boiler must always be relatively poor, and demand a wide temperature differential. The gases that leave the boiler are therefore always several hundred degrees F. hotter than the boiler temperature. The purpose of economisers is to utilise the waste heat that is present in these flue gases, which would otherwise be lost. This is done by means of a series of tubes in which the incoming feed water is brought into contact with the flue gases. The water is thereby heated, and less work has to be done by the main boiler in converting it to steam. Care must be taken that the effective draught is not reduced by this process, or the saving effected by the economiser will be offset by the cost of providing forced draught. In general, however, the installation of economisers will effect appreciable savings in fuel consumption.

Circulators

The only way in which water can be rapidly and effectively heated is by the continual replacement at the heating surfaces of the layers of water which have already become heated by layers of cooler water. This process entails circulation of water within the boiler, and a high degree of circulation is the aim of all boiler designers. This circulation is normally achieved by the convection cur-

rents set up within the boiler, but in many boilers the amount of circulation occurring leaves much to be desired. Several devices have been designed for overcoming this defect, some depending upon the pumping of water from one part of the boiler to another, others depending on convection and priming effects within the boiler. Static circulators of the latter type have been found on occasion to increase the performance of shell boilers by as much as 20%, and increases of 10% are not uncommon. It has also been found that badly priming boilers delivering wet steam are often completely cured of this defect, as well as improved in efficiency, by the introduction of good static circulators.

Steam accumulators

In a great many factories there are considerable fluctuations, over the working day, in the amount of steam required. The usual practice is to equip the factory with steam-producing plant of sufficient capacity to accommodate peak demands, and to run the steam-raising plant at reduced speeds during off-peak hours. The variations in firing rate which this process involves can be very wasteful of fuel, and a good deal of elaborate timing is necessary if hold-ups are to be avoided. Much of this trouble can often be prevented by the installation of steam accumulators. Several types of these are available, some of which can be adapted to existing boilers, which may then be fired by their own furnaces or used as steam accumulators, as required. In general, the accumulators work on the following principle. During off-peak hours, when the production of steam is surplus to requirements, steam is injected into water in the accumulators. The temperature and pressure within the accumulator rise as the incoming steam condenses until they are at a level somewhat below that of the main boilers, at which point steam injection is automatically cut off. When extra steam is required, the outlet valve is opened, and as the internal pressure falls the water commences to boil and emit steam. The pressure of this stored steam will always be somewhat below the normal boiler pressure, but will be adequate for most heating purposes.

Boiler-room instruments

It is impossible fully to describe the benefits which are to be obtained by the installation of all the many kinds of metering devices and automatic control systems which are now available for use with steam raising equipment. Mention can only be made of one or two of the more important of them.

Steam meters. If properly read and understood, these instruments can save anything from 5 to 25% in fuel consumption.[2] Steam meters are of three types—indicating, counting, and graphically recording, and their usefulness increases in this order. Simple indicating meters have little to recommend them for routine use, as they are subject to considerable errors and variations, to correct which somewhat complicated calculations are necessary. Counting meters are more useful, particularly where fluctuations in demand are small, as they enable the amount of steam used over any period to be accurately known. Unless frequent readings are taken, however, fluctuations in steam usage cannot be followed.

Recording meters are made in two types, one using a circular and the other a rectangular chart. The former plots the rate of steam flow at any given time, and periods of high and low steam usage are therefore clearly indicated. It is rather difficult, however—though not impossible—to calculate from them the total weight of steam delivered over a period. The most satisfactory type of steam meter is undoubtedly the recording instrument designed for use with a rectangular chart. This enables actual steam usage over any particular period to be determined with accuracy, so that a careful check can be kept on all operations.

Water meters. In order for the full benefit to be obtained from a steam meter, it is best used in conjunction with a water meter, which should also preferably be a recording instrument. It is then possible to measure accurately not only the quantity of steam used in plant operations, but the quantity lost by blow-downs, leakages, and similar factors. Losses detected in this way are often surprisingly large, and their detection can lead to very considerable fuel savings.

CO_2 recorders. The fuel losses which can occur in the flue gases, and which can be rectified if the composition of these gases is to some extent known, are not fully appreciated in many small plants. A knowledge of the carbon dioxide (CO_2) content of the gases is alone of great value in this respect. A low CO_2 content can arise from one of two causes. It may be due, on the one hand, to excess air passing through the furnace, which has the effect of diluting the emergent CO_2. Since all gases leaving the furnace carry away unused heat, such an excess of air is undesirable, and its correction will result in a more economical utilisation of the fuel. On the other hand, a low CO_2 content may be due to the presence of large amounts of uncombusted carbon monoxide, arising from the fact that the fuel bed is too thick and the emergent CO too cold to ignite when it meets the secondary air. This means that a good deal of fuel is leaving the furnace unused. It has been stated[2] that losses of 40%, or 8 cwt. per ton of coal, are not unusual in small works' boilers from this cause. The value of a CO_2 recorder at once becomes apparent. The simple recorder will not, it is true, differentiate between the two causes of low CO_2 content, but differential recorders are also available which clearly indicate when the CO content is high; and in normal cases there is, in fact, little danger of the two cases being confused.

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AIDS TO FUEL EFFICIENCY

Equipment, Instruments and Services

Improved Boilers

The *Bouëllat* boiler is a comparatively small boiler which is claimed to embody modern improvements developed over recent years for larger installations.

There are two main designs: the "A" type boiler which is now made in outputs up to 50,000 lb./hr. of steam and 750 p.s.i.g., and the "B" type boilers which are made in outputs up to 10 million B.Th.U./hr. and 150 p.s.i.g.

The "A" type boiler is a full watertube boiler provided with a relatively large furnace, fully water-cooled by finned tubes closing the furnace on all four sides. Thus insulation is only necessary against saturation temperature of the water. Casings are made from easily removable panels. Brickwork in the furnace is kept to the bare minimum.

The convection section is formed by a bank of 1½ in. o.d. water tubes. Plugs are provided for the internal inspection of representative tubes, and a superheater or economiser can be provided.

Special attention has been given to the provision of proper circulation in the various sections. Separate downcomers are provided from the drum to the furnace-wall circuits.

The makers, Bouëllat Engineering, Ltd., claim that the boiler has considerable advantages in space and floor area occupied, and weight, in comparison with a shell-type boiler for a similar output. As an example of its compactness, in one French chocolate factory an "A" type gas fired boiler is arranged next to sugar mixing machines and other production plant. Apart from the space saving, no separate attendant is required for the boiler, since an employee is continually present in the shop.

Efficiency is said to compare very favourably with a shell-type boiler under the same operating conditions. Experience suggests that the boiler may be brought up to pressure from cold in half an hour. The boiler is said to have a very low radiation loss due to the water-cooled furnace and satisfactory insulation.

The *Bouëllat* "B" type boiler is a combination of a steel sectional boiler and a water tube boiler. It is designed as a steel boiler, making full use of the potentialities of this material. It consists of five sections: two side sections, a front section, a rear section and a roof section all interconnected by special expanded joints. Hot water boilers are provided with one or more flow stools on the top section whereas steam boilers carry on the top section a steam and water drum arranged centrally front to back.

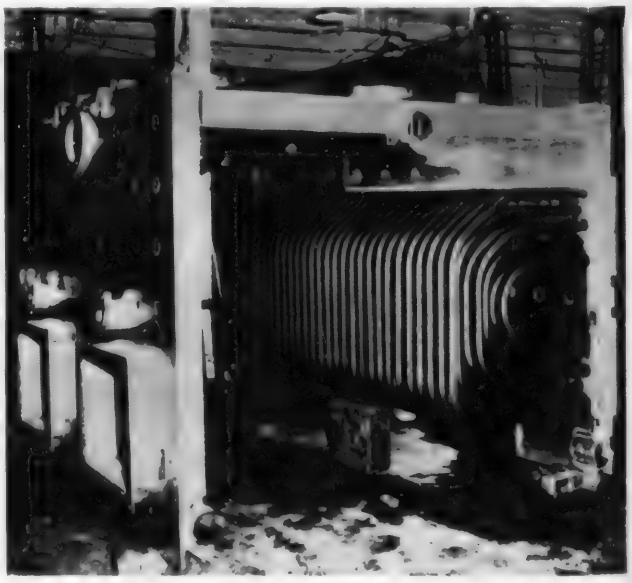
Instruments for Boilerhouses

In addition to other data, it is essential to good boiler practice to have complete information upon the percentage CO_2 in flues and stacks, flue gas temperatures, and draught in the main flue. The Cambridge Instrument Co., Ltd., who manufacture several instruments for boilerhouse installations, suggest that for small installations, a typical outfit would comprise:

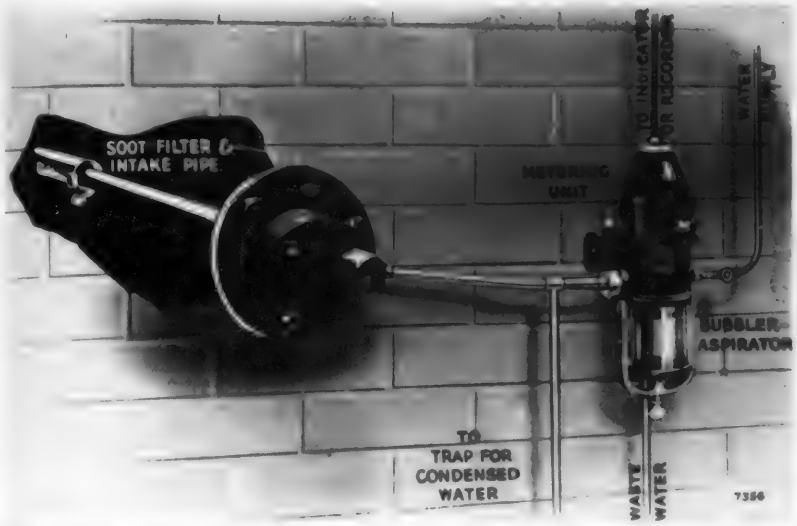
(*a*) Small, compact, single-point Model "B" thread recorder, ranged 0-20% CO_2 or, in a 2-point instrument, arranged to record continuously CO_2 content and flue gas temperature.

(*b*) CO_2 metering unit incorporating meter (*Katharometer*) and bubbler aspirator mounted near stack or side flues and continuously drawing flue gas samples through a suitable soot filter. Electrical connections permit installation of recorder in remote positions, *e.g.* in engineer's office.

(*c*) Illuminated moving-scale indicator (also connected to CO_2 metering unit) indicating CO_2 content on exceptionally wide, open scale which can be easily read from considerable distances and in dark, inaccessible places. Green, red, and white zonal mark-



Bouëllat 3 million B.Th.U./hr "B" Type boiler in the course of erection.



Installation of Cambridge CO_2-metering unit and combined soot filter and intake pipe.

ings stress when CO_2 content is low, excessively high, and satisfactory respectively.

(*d*) An 8 in. dia. scale draught gauge (alternatively, vertical edgewise scale indicator), calibrated 0-1 in. water upwards, for indicating draught over or under the grate of forced (or induced) draught boilers.

(*e*) One or more mercury-in-steel index thermometers, scale diameters 4 in., 6 in., or 8 in., measuring flue gas, air, water, or steam temperatures.

In larger installations with 2 (or more) boilers it is practicable to instal two (or more) Model "B" recorders with their measurements confined to those of CO_2 or temperature (not both on one instrument). For CO_2, it is sometimes convenient to instal a single CO_2 metering unit and a selector system enabling samples to be analysed from 3, 4, or more separate flues independently and in succession.

A multi-point electrical indicator with resistance thermometers or thermocouples is employed where it is essential and convenient to measure a number of different temperatures on one instrument. A special type of rotary switch with easily interchangeable cartridges permits selection of the various temperature points in rapid succession.

For more complex installations, instruments can be supplied for the measurement of conductivity and *p*H, and for determining the dissolved oxygen content of the boiler feed water.

Cleaning Boiler Tubes

Seventy boiler tubes can be cleaned in 4 min. using the *Willcox Rapid-action* cleaner, according to its makers W. H. Willcox and Co., Ltd. Cleaning is effected with the fire lowered and using the boiler's own steam so that the boiler does not need to be shut down. A jet of heated air and dried steam swirls through the tubes at high velocity. Willcox say that there is no condensation and that this overcomes the fault of the old steam lance which caused the soot to form a wet, sticky mass and encrust the tube.

The cleaner is supplied complete in every respect, including a high-pressure steam valve with $\frac{3}{4}$ in. B.S.P. inlet, and one cleaner will serve several boilers by installing a steam valve on each. Cleaners for either smoke-tubes or water tubes are available, or there is a "combined" pattern for both. It is normally supplied with a straight lance, but a range of bent and cranked lances for reaching round obstructions is stocked by the makers.

Forced Draught Furnace

A system of forced draught, which is claimed to give even distribution of air over the whole of the grate area and which can be applied to all classes of steam boilers, is provided by *Turbine* patent furnaces, manufactured by the Turbine Furnace Co., Ltd.

There are no moving parts in contact with the fire, and the makers say that over a number of years the renewals necessary are light.

Mechanical firing can be applied by fitting shovel or sprinkler type (over fire) stokers. A set of these furnaces recently tested by an independent body gave a plant efficiency of over 65% on a bare boiler using slack coal according to the company. The grate in question, a steam jet forced draught furnace, was installed over 10 years ago and the upkeep cost has been very low indeed.

Purified Boiler Feed Water

A wide range of plants for producing softened, scale-free boiler feed water is supplied by the Permutit Co., Ltd. Modern boiler practice will not tolerate hard water, they say, and claim that the most effective way of removing scale-forming elements is to remove the calcium and magnesium salts by passing the water through a *Permutit* ion exchange softener. This contains a bed of ion exchange materials which exchanges the calcium and magnesium salts for sodium salts which have no hardness characteristics. After a given quantity of water has been treated in this way, the ion exchange material has to be regenerated with salt before a further quantity of water can be softened. Regeneration can be undertaken automatically.

Other methods of softening water can be applied, and similarly more drastic treatment of the water will require a different type of plant. Selection of the correct water treatment plant requires considerable skill and experience, say Permutit. Much depends on

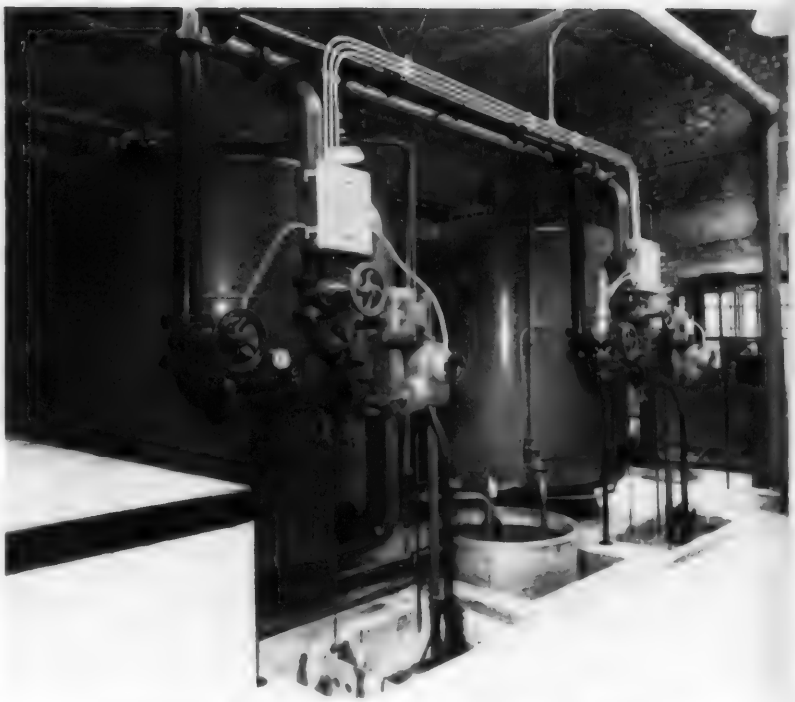
the quality of the water to be treated, particularly as "raw" water varies in quality.

Steam Traps

The prime essential of efficient use of steam is efficient removal of condensate. Steam should be retained in the coil or jacket until it is condensed, and the full latent heat is extracted. Approximately 1,000 B.T.U.'s are obtained from the condensation of 1 lb. of saturated steam without temperature drop, but a temperature fall of 1°F. by 1 lb. of condensate only gives 1 B.T.U. To make full use, therefore, of the available heating area condensate must be effectively removed on formation.

On these principles the Drayton Regulator and Instrument Co., Ltd., have developed the *Drayton/Armstrong* inverted bucket trap, which, when correctly sized and installed, they say, efficiently removes condensate when formed without passing any live steam. The trap consists of a body of suitable material, a valve and seat hardened and hemispherically ground to hold pressures of over 900 p.s.i., a free floating lever mechanism, the friction and wear in this being reduced to the minimum, and an inverted bucket.

Whilst the trap body is filled with steam the bucket holds the valve against the seat. As condensate enters the body, the bucket falls but the free floating mechanism takes up this fall until the condensate reaches the operating level, when the valve is removed from the seat. Condensate is then forced through the seat until the bucket is again floated on steam, when the valve snaps shut. The action of the condensate makes the trap self-scouring, and the friction free movement ensures a long life without maintenance, 10 years' service without maintenance not being uncommon. As this trap is not reliant on temperature differential, it may be mounted as close as possible to the equipment it is draining without a cooling leg. Thus full use is made of the heat available.



Two Permutit fully-automatic base-exchange water softeners.

Air venting by means of a suitably positioned *Drico* balanced pressure trap ensures that full use is made of the heating area. These traps have a hydraulically formed bellows element, the formation process being self-testing, and are guaranteed for two years for pressures up to 80 p.s.i. Being formed from deep-drawn tube, with only one open end, there is no soldered joint in contact with the live steam. The traps operate at very near-to-steam temperatures.

Thermostatic control of processes, and more particularly space heating, can produce great savings of fuel. The Drayton-Regulator and Instrument Company also make a wide range of self, air and electrically operated controls.

Thermostatic Mixing Valves

Walker, Crosweller and Co., Ltd., claim that their *Leonard* thermostatic steam water heaters supply hot water instantly where and when wanted from steam and cold water supplies. There is no necessity to wait for the hot water supply to heat up in the morning, particularly after the week-end, and no running cold in the afternoon. Being thermostatically controlled, the temperature of the hot or warm water remains steady. It can be varied at will from cold to 200°F. or more by a simple movement of the regulating handle.

The advantages claimed for the valves are that there is no heat storage and therefore no heat losses; no heat exchange equipment is necessary; the apparatus is as simple to service as an ordinary stop valve and takes up no more room.

Hard water may cause deposits, which if severe enough, may interfere, but all working parts are easily accessible and can be readily freed from scale deposits.

Within the *Leonard* a bimetallic coil winds or unwinds according to the temperature of the water in the mixing chamber, and in so doing opens and closes the ports, admitting the steam and cold water. If the outflow begins to get

too hot the thermostat cuts down the steam and lets in more cold water; if it gets too cold it opens up the steam ports and cuts down the water. If either fails the thermostat closes against the other and lets through only as much of either as can seep through the clearances. That saves the risk of overheating and possibly ruining of certain kinds of food.

In establishments where steam is not available *Leonard* thermostatic hot and cold water mixing valves perform the same services as described above. They automatically mix hot and cold water and give warm water at controlled temperatures.

Thermostatic Valves

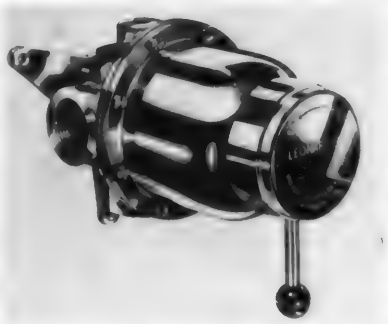
Danfoss Manufacturing Co. manufacture a wide range of thermostatic water and steam valves which they claim can contribute considerably to fuel saving in heating and cooling processes. A Thermostatic Radiator Valve is also available, which requires no electrical supply; is simple to fix and adjust; and will provide individual room control which can be locked at any temperature.

Controls and accessories for oil burners, thermostats, pressure switches and electric motor starters and contactors are also made by Danfoss.

Temperature Control Switches

The importance of temperature control for ensuring fuel efficiency is stressed by the Graviner Manufacturing Co., who have over 20 years experience in the manufacture of temperature control switches. The Graviner temperature control switch is a bimetallic differential expansion system, consisting of a bow structure of low expansion coefficient contained in a brass or stainless steel case. The bow structure to which is fitted a pair of contacts is used for amplifying the small movement of the case to obtain a relatively larger movement of the contacts.

The brass or stainless steel shell, being the temperature-sensitive component, is designed to present a larger heat-responsive area to the radiant or conducted energy to be controlled. Thus is ensured a high sensitivity, close control and low thermal lag.



The Leonard Thermostatic mixing valve, made by Walker, Crosweller and Co., Ltd. The valve enables a hot water supply of constant temperature to be obtained from steam and cold water.

Handling Heat-Sensitive Foods

A new evaporator operating on the heat pump system has been developed by Kestner Evaporator and Engineering Co., Ltd., for handling heat-sensitive materials, particularly liquid foodstuffs.

Known as the *Coolcentrator*, the evaporator is described by Kestner as an entirely new system for the continuous concentration or distillation of liquids at low temperatures without the use of steam. Among the advantages claimed for the new evaporator are very high thermal efficiency, corresponding to triple, quadruple and even quintuple effect economy.

Instead of steam, ammonia gas is used as the heat transmission medium. The plant comprises essentially a climbing film calandria, separator and condenser, together with a compressor. Ammonia (or methyl chloride, *Freon*, etc.) gas is heated by compression and delivered into the heating space of the calandria, where it condenses, giving up its heat to the liquor being concentrated. The condensed liquid ammonia is cooled by passing through an expansion valve, thence into the tubes of the condenser where the pressure is lower than in the calandria.

The water vapour removed from the liquor in the calandria passes to the outside of the condenser tubes, where it condenses on the cold tube surface. In so doing it evaporates the liquid ammonia in the condenser and the resulting ammonia gas passes on to the suction side of the compressor and is pumped back into the heating space of the calandria.

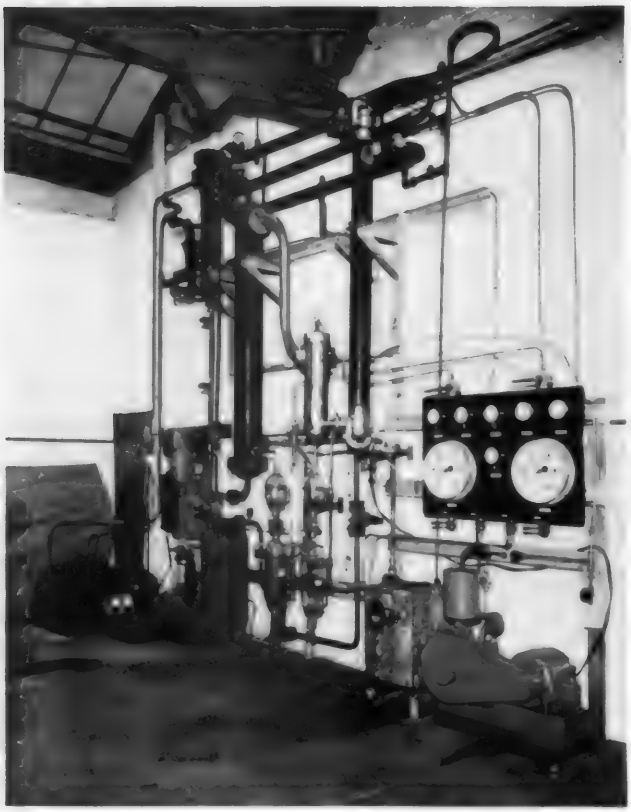
Thus the ammonia circulates continuously round a closed circuit receiving heat in the compressor and losing heat in the calandria. In principle the ammonia circuit is similar to a refrigeration plant, except that in the *Coolcentrator* the functions of the usual refrigerator "condenser" and "evaporator" are reversed.

Heat enters the system only at the compressor in the form of energy. In other words, the compressor operates simply as a heat pump. The equivalent in heat of this energy put into the compressor is only a fraction of the latent heat required for evaporation of water in concentrating the liquor, say Kestner. Accordingly the efficiency is very high and equivalent to the performance of a normal steam-heated multiple effect evaporator but working at far lower operating temperatures.

Spray and Flash Dryers

Spray dryers and flash dryers are made by the Danish Company Anhydro A/S which, particularly when used with a continuous evaporator made by Leonard Smith (Engineers), Ltd. (who handle Anhydro's equipment in the U.K.), is said to produce very considerable fuel saving compared with alternative methods.

Taking for example the production of skim milk powder, Smith's say that 1,000 gal. of skim may be concentrated to 50% solids in one of their double effect evaporators by a total steam requirement of 3,230 lb. or somewhat less in the case of a triple effect evaporator. The steam required to



The Coolcentrator, an evaporator made by the Kestner Evaporator and Engineering Co., Ltd., and described on p. 469.

dry the concentrate to powder is just over 2,000 lb. Thus it will be seen that 1,000 gal. skim may be converted to powder by a little over 5,200 lb. of steam.

This economy is influenced by the ability of the evaporator and that of the atomiser on the drier to handle the higher solids content, as for practical purposes a spray drier requires five times as much steam as the evaporator to evaporate 1 lb. of water.

Provided the drier is capable of producing a first-class product at the higher drying temperature possible by the use of indirect combustion gas heating, then further economies are possible by employing an oil fired combustion chamber instead of a steam heater. In the example stated above the steam required is just over 2,000 lb., and the same throughput may be dried by burning 120 lb. of fuel oil.

It is claimed that, where suitable, the flash drier provides a most economic means of reducing the moisture content in foodstuffs such as flour. Here again, either a steam heater or an oil fired combustion chamber may be used, the powder being fed continuously and, in fact, a pneumatic duct system will deliver the product to the desired bagging off point without significant increase in power consumption.

Electricity and Food Manufacture

The extended use of electricity in the food manufacturing industry leads to fuel efficiency, according to the British Electrical Development Association, because electricity is generated from low-grade coal which is quite unsuitable for use in domestic grates, but which can be utilised in the boilers of modern electric power stations.

Cooking is an essential in many food manufacturing processes, and it is here that electricity is supreme. It provides a steady dependable heat, capable of the most critical control so that results can be repeated with certainty, and all without the need for stoking, providing for fuel storage and ash removal. Cleanliness is assured as no dust and dirt is produced by electrical appliances.

A particularly useful device, recently developed, is the electrical heating tape, narrow and thin, made of plastic, inside which is a wire heating element. This can be coiled spirally round a pipe conveying a viscous liquid (chocolate for example) so that the liquid can be warmed continuously and maintained in a fluid condition. In other words, the tape provides controlled heat just where it is required.

Hot Air Heater

A new hot-air blower, the *Secomak* re-entrant heater, was shown for the first time at the Engineering Exhibition at Olympia last month by the Service Electric Co., Ltd. The heater is designed for use where exceptionally high temperatures are required, or where it is desired to reduce the loading of the element to a minimum. Temperatures 25% higher than those from standard heaters are now obtainable with a similar loading, or equivalent temperatures with loadings 25% to 30% lower. The maximum nozzle temperature of the re-entrant heater is 900°F. as against 700°F. with existing standard-type heaters.

In the re-entrant heater air is pre-heated by being circulated between concentric tubes before finally passing over the element. An advantage of this is the outside of the heater runs comparatively cool.

The re-entrant heater may be fitted to the outlet of any *Secomak* blower, or may be used at the end of a pipe or flexible hose. Air at ambient temperatures enters the heater at the left-hand end and hot air comes out of the nozzle on the right. The diameter of the nozzle may be anything up to 2 in., and may be fitted with a 2-in. B.S.P. adaptor. Standard loadings are 1, 2 or 3 kW. The heater weighs 9 lb. Overall dimensions are 15 in. long by $4\frac{3}{4}$ in. by $4\frac{1}{4}$ in.

MAKING THE MOST OF HEAT AND POWER

Last month the National Industries Fuel Efficiency Service published its 3rd annual Progress Survey. In the three years of its existence interest in fuel efficiency and conservation has increased considerably and the demand for its services is growing. Here is a summary of these services for manufacturers.

THE task of the National Industrial Fuel Efficiency Service, in the three years since it commenced its work, has been to show industry how to use heat and power, in all its forms, to the fullest and most efficient extent. It has evolved a pattern of services, which is continually adapted to meet changing conditions and demands, designed to offer the maximum help to industry. There are four main services:

(1) Specific Advisory Service;
(2) Heat and Power Surveys;
(3) Regular Service Agreements;
(4) Training and Education.

In addition, visits are made by trained engineers who assess a firm's fuel problems and decide whether more detailed investigation is likely to result in additional fuel saving.

Specific advisory service

During N.I.F.E.S. second year of operation, it became obvious that there were firms requiring information which, though not needing a lengthy examination or an instrumented survey, called for a high standard of technical experience to answer. To meet this need, a Specific Advisory Service was introduced in June, 1956, and by the end of March this year, 464 firms had used the new service. Advice has been given on the abatement of smoke and grit, the insulation and space heating of buildings, the correct operation of existing plant, the burning of waste products, flash steam recovery and the choice of new boiler plant. Other consumers asked for checks of combustion efficiency, confirmation of their own engineers' calculations of heat losses or of their assessment of how best to meet the increased heat requirements needed if production was increased or the factory extended.

Courtesy of N.I.F.E.S.

Above: **N.I.F.E.S. engineers reading air velocity at recuperator inlet and temperature recorder fitted to nearby continuous reheating furnace.**

Heat and power surveys

The Heat and Power Survey is the most important of N.I.F.E.S. services. It is a technique for the study of the flow of heat through the factory and for the determination of the real needs of the process. Providing, as it does, precise measurement of the efficiency with which fuel is being used and of the savings that can be made, the survey carries conviction in a way that otherwise is hardly possible.

More waste occurs in the utilisation of the heat, in the factory itself, than in the boiler plant. The most obvious example, and the easiest to put right, is the waste in factory heating, through failure to install structural insulation or to control the space heating thermostatically. Just as serious is the waste that occurs by using steam at too high pressures or temperatures, by continuing heating for longer than is necessary, by neglect of the possibilities of using exhaust heat, etc.

One firm, the Midland Model Dairy Farm, Ltd., have cut their fuel bill by about one-third by replacing two hand-fired vertical boilers with a new economic boiler, complete with mechanical firing, induced draught and grit-arresting equipment on N.I.F.E.S. advice. This firm first approached N.I.F.E.S. because of serious grit emission from the old plant. The survey showed that the plant was at times so overloaded it was questionable whether it was worthwhile fitting new equipment. It was decided to install a new boiler plant; this boiler is now working satisfactorily and coal consumption has been reduced by about 8 tons a week. It is also interesting to note that a successful application for a loan to cover the cost of the new plant was made under the Government Scheme which provides loans for fuel saving equipment if the results are substantial in relation to expenditure.

Even those firms which are well aware of the value of fuel efficiency and have applied its principles to the running of their plant, can find that an instrumented test is most enlightening. The efficient use of fuel had long been an important concern of the management of Alfred Bird and Sons, Ltd., the Birmingham food manufacturers. Steam was used both for process work in the preparation of the food products and for space-heating and, although the factory was over 50 years old, regular attention had been paid to the plant to ensure that its efficiency was maintained.

The management, however, began to question whether, in fact, the boiler plant was being operated as economically as possible. Lack of instrumentation made it impossible for their engineering staff to keep a close check on efficiency, and N.I.F.E.S. was asked to carry out a test. The results were very pleasing to the firm for, contrary to their expectations, the boilers were found to be working at a higher efficiency than they had thought. Nevertheless, N.I.F.E.S. was able to recommend a number of minor and inexpensive improvements which would prevent heat loss and so improve the efficiency still further. In addition, hot water which previously ran to waste is now used for plant cleaning.

Maintenance of efficiency standards

Under the Regular Service Agreement a series of regular visits is made by an engineer, which enables him to check on operating standards and provides an opportunity for the staff to discuss with a specialist any problem that arises.

For instance, a firm manufacturing confectionery required assistance in making steam consumption tests of process equipment as an aid to costing certain products. This work led to an inspection of the boilerhouse and, ultimately, to a Regular Service Agreement, whereby regular advice and assistance were made available to the firm. The advice tendered has mainly concerned the economiser, which was not then used at night because of difficulties of draught control. With a N.I.F.E.S. engineer present for several nights, the economiser was kept in use and the feed water temperature was raised substantially. Further improvements were achieved by adjustment to dampers and repairs to boiler settings. Fuel savings are estimated to be of the order of $7\frac{1}{2}\%$.

Training and education

Inefficient boiler operators are one of the main causes of incomplete combustion in industrial boiler plant. The man who knows the correct way to fire a boiler not only prevents smoke but can, if he thoroughly understands the principles of combustion and the working of his plant, make adjustments of technique to fit rapidly changing conditions and prepare in advance for known peaks in steam demand.

Training available at technical colleges, admirable though it is, is subject to the difficulties associated with shift work and travelling to the classes, etc. N.I.F.E.S. training scheme for boiler operators takes the course to the man, providing him with material which he could study at home and supplementing this with practical instruction on his own, or similar plant, nearby. Both men and employers are required to play their part; the men by giving up some of their leisure to study and the employers by allowing the eight days practical instruction during the 21 weeks of the course as time off without loss of wages. Special arrangements are made to meet the requirements of shift workers.

The men are trained to the standard of the City and Guilds of London Institute Boiler Operators Certificate, and over 2,000 have enrolled since the scheme came into operation two years ago. But the way to judge the success of any course is to assess the wastage which always occurs as students lose interest, and in this case 95% of those enrolling complete it. This is also a fair indication that, despite their varying ages and educational background, practically all the men are able to absorb theoretical knowledge. Of those who sit the City and Guilds examination, which is optional, well over 80% are successful. Incidentally, N.I.F.E.S. makes all the necessary arrangements for those wishing to sit the examination.

With production costs mounting, it is difficult to believe that any industrialist is indifferent to the cost of fuel. Increasing numbers of firms in every type of industry are finding out for themselves that fuel efficiency is worthwhile in all cases.

Pea Canning in Western U.S.A.

By W. V. Cruess *

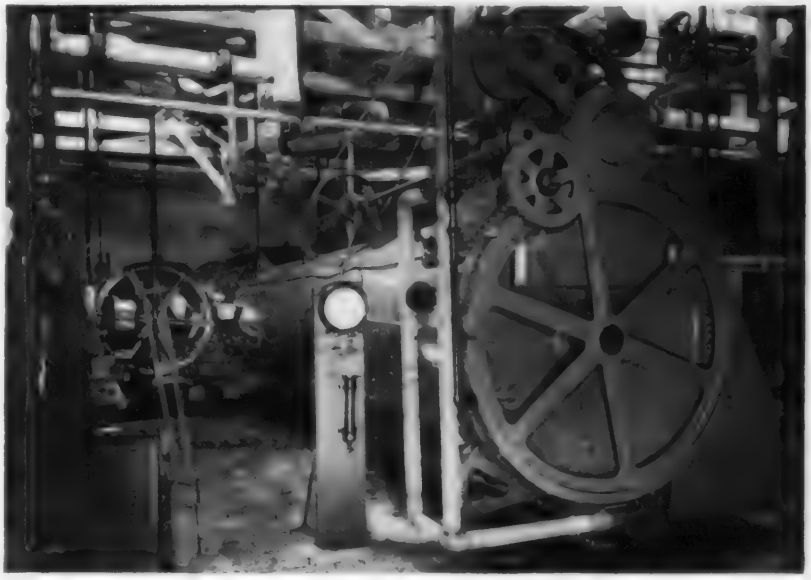
The Blue Mountain region of western U.S.A. has become a large-scale producer of canned and frozen peas. Dr. Cruess, well known in this country and in the U.S.A. as an authority on the processing of fruit and vegetables, has recently visited the area during the canning season, and he gives below an account of his impressions of various factories. Many of the problems faced by manufacturers in this area are common to the industry in this country, so that Dr. Cruess's comments are of wide interest.

DURING the past 25 years the Blue Mountain region of South-eastern Washington, North-eastern Oregon and South-western Idaho has become a very important producer of canned and frozen peas. Until 1932 grain, chiefly wheat, was the principal crop of the region, and this is still of great importance.

In 1931 and '32, however, a committee of the Walla Walla Chamber of Commerce undertook to foster the founding of a food processing industry in order that the region should not forever be dependent on a single crop. Strawberries, raspberries, green beans, cherries, spinach, tomatoes, tomato juice, asparagus and Italian-variety fresh prunes were canned experimentally, the total pack for all products being 32,115 cases. E. B. Foster, a pea grower, of Pendleton, and Frank C. Sloan, a seed producer, arranged for the picking of enough green peas by Indian girls from the Umatilla reservation for a canning test. The peas were rushed to the cannery, where they were shelled by hand and canned; only 69 cases were canned in 1932. All of the various canned products were sold at a profit. The asparagus pack was 5,242 cases, Italian fresh prunes 1,000 cases and spinach 1,200 cases. Asparagus is still packed commercially in Walla Walla.

In 1933 the plant was enlarged and most attention was given to peas. The total pack of all products was 201,515 cases, and of this peas constituted 88,781 cases.

Many firms have now established factories in the area, and in several cases large growers of peas are financially interested in and have been active in establishing and operating canneries and freezers.



FMC continuous retort in use in a pea canning factory. The use of cookers of this type allows a continuous operation to be maintained throughout the canning line.

Vining the peas

After harvesting, the peas are vined by one of two systems. In the more common one the vines are taken to nearby viners located in the field. Here they are vined (*i.e.* the peas are shelled from the pods) and filled into 50 lb. lug boxes. In the second system the vines are trucked to viners located on the hillside above the cannery.

As peas deteriorate rapidly after vining, as little time as possible is allowed to elapse between vining and canning, the aim being to have the peas in the cans within four hours of vining. In hot weather the shelled peas may sweat and heat in the boxes if canning is unduly delayed. Icing or pre-cooling by FMC stericooler, etc., are not practised, as such treatment is not considered essential; there are times, however, when some form of pre-cooling might prove beneficial.

When peas are vined at the canning or freezing plant, the shelled peas are conveyed into the plant in cold water in pipes or flumes; hence they do not get an opportunity to sweat or heat before canning. However, trucking the vines from the fields to the cannery is more costly than transporting the shelled peas in boxes. Both methods (field vining and vining at the plant) have their ardent supporters. Those who favour vining at the cannery contend that the peas enter the cannery in fresher condition and have a higher sugar content than when vined in the field. However, exponents of vining in the field maintain that the peas in the pod on the cut vines can deteriorate between cutting in the field and vining at the cannery.

* Food Technology Dept., University of California.

Where peas are vined in the field and sit in lug boxes long enough for the surface of the peas to become dry the so-called viner juice problem arises. In vining some juice is "hammered out" of the pods, stems and leaves, and it coats the peas. When this juice becomes dry it may be difficult to remove at the cannery. It may carry dust particles and other debris, and if sweating occurs may contain large number of bacteria.

At the plant, however, the peas are flumed or pumped in water repeatedly and undergo several washings in the journey from lug box to can, and in the blancher are heated for about 2-3 min. in hot water, an operation followed by fluming in water. Therefore, by the time the peas reach the can they can reasonably free of viner juice.

Where the peas are vined at the cannery or freezer any viner juice on the peas does not get an opportunity to become dry and is promply removed during preliminary fluming and washing operations.

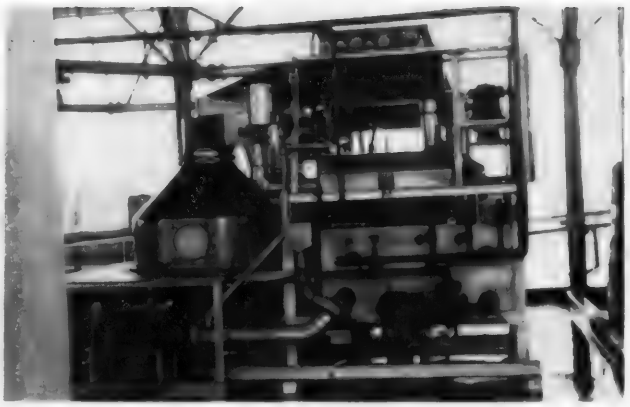
Layout of canneries

While operations vary somewhat in the different canneries the following outline is fairly typical. It does not purport to be the exact procedure followed in any one plant.

The boxes of peas are dumped on to a conveyor by hand or by automatic dumper at a constant rate in order that flow of peas through the various operations will be uniform and equipment will not be overloaded. One method of securing uniform rate of dumping is to have a light at the dumping station that flashes at regular intervals. Where vining is done at the plant the flow of shelled peas is quite uniform.

Usually the first operation is scalper cleaning in which the peas pass through a large flat oscillating screen and coarse trash such as stems, wheat stalks, etc., pass over the screen. Next is the clipper cleaner in which the peas are further "dry cleaned" by air blast and screens.

In the next operation, that is, in a Key froth flotation cleaner, they are agitated in a frothy liquid consisting of water, a special soap, air bubbles and special refined, colourless mineral oil. The broken hulls, thistle buds, nightshade berries and other "trash" pick up air bubbles and are carried away by flotation. The whole peas sink and are then pumped to a rotary screen, spray washer, which removes any oil or soap. The washed peas are usually graded for size in a conventional rotating screen grader. The peas are then blanched in water at about 190-210°F. for 1½ to 6 minutes, depending on maturity. They are then cooled, usually by fluming and are dewatered by screen. Next they are inspected on slowly moving white rubber belts, and any unfit peas or foreign material are removed by the sorters. Quality grading in 38° salometer brine separates the A grade or best quality peas from the more mature peas of lower grade. The best peas float; the more mature ones sink. Usually one such brine treatment is used, but two may be employed, the second being a stronger brine to separate the B grade from the sub-standard peas. The peas are next spray washed to remove adhering brine. They may then be belt inspected and sorted as previously outlined. They are then elevated to the large conical hopper which feeds them into the small hopper of the can filler. They are filled into cans, a measured volume into each can. A hot, light, sweetened brine is added, a definite, measured volume to each can. The cans are sealed in a steam flow double seamer or the lids may be given the first operation (*i.e.* clinched) and the cans sealed under vacuum. The sealed cans are retorted, usually in stationary retorts, at 240°F. for 26-35 min. for 303 size cans or at 250°F. for 15-16 min. However, in most cases the "official" National Canners' Association times were used at 240°F. or 250°F. In one plant a continuous FMC cooker was in use, the cook being 15 min. at 248°F. for 303 size cans. The retorted cans are cooled to 100-110°F., labelled and cased or cased bright (unlabelled) in fibre board cartons.



Key Co. flotation separator for the removal of berries, leaves, and other trash.

We shall now discuss several of the operations and pieces of equipment further:

Door tests

The shelled peas on delivery are thoroughly examined and the grower paid according to quality determined by such tests. A 25 or 30 lb. representative sample is passed through a small clipper cleaner and the percentage of trash determined. A 10 lb. sample of the cleaned peas is size graded in a small cylindrical screen grader and the percentages of the various sizes determined. A composite sample and samples of the various size grades are tested on a tenderometer.

The brine flotation test is also used very generally. In one plant this consisted in taking 50 blanched peas from a representative sample, skinning them and placing the individual cotyledons (the "halved" peas) in a beaker of brine of 13° salometer. The brine is in a beaker and the peas are held on a circular screen

slightly smaller in cross section than the beaker. When the screen is forced beneath the brine the peas are "on their own" to float or sink. If of A grade, most of the halved peas should float. The U.S.D.A. Marketing Administration requirement of A grade peas meter; not more than 12 may sink in 10 sec. in a brine of 13° salometer; not more than 12 may sink in 10 sec. in a brine of 11° salometer. The laboratories in the Blue Mountain region have bottles of brines of several salometer degrees, such as 11, 12, 13, 14 and 15° salometer. For ease of identification and speed the various brines are given different colours by use of dyes. By using two or more brines the quality of the peas can be assessed quite closely.

Cleaning the peas

Clipper cleaners are used to remove much of the trash brought in with the peas such as leaves, pieces of vine, stems, pods, stones, wheat stems, dirt, etc. A fan is used to create a blast of air or suction that removes much of the lighter trash. There are usually two screens through which the peas fall; the coarse trash passes over the end of the screen, which acts as a scalper. Usually, however, a large scalper screen is used to remove much of the coarse trash before the peas enter the clipper cleaner. A bottom screen of finer mesh in the clipper cleaner allows fine dirt and shrivelled peas to pass through and retains the good peas. The cleaned peas are delivered at the bottom of the machine. Greater efficiency is usually secured by placing the air blast or air suction above, that is ahead of, the top screen, as it reduces the load on the screens. The clipper cleaner makes a substantially saving in labour of sorting and reduces the load on the key froth flotation cleaner.

The scalper screen and the clipper cleaner might be termed the "dry cleaning department."

In most canneries the peas are pumped in water one or more times from one operation to the next, for example, pumping the cooled, blanched peas to a dewatering screen that feeds the peas to a conveyor to the brine quality grader.

Froth flotation

The principle on which the Key flotation cleaner operates was discovered and developed by Newbert and Veldhius, agricultural research workers in Washington state in 1945. The separation of certain undesirable foreign material depends on the difference in wettability of peas, compared with that of nightshade berries, small thistle buds, hulls of peas broken in vining, burrs, leaves, tar weed fragments and similar foreign materials in a frothy mixture of small air bubbles, water, a special soap of high detergent power and tasteless, colourless, odourless, highly refined light mineral oil. The nightshade berries and other trash mentioned above collect air bubbles and float to the surface, whereas the peas sink to the bottom. They are pumped or flumed to a dewatering reel for recovery of the solution and are then washed under sprays of water to remove adhering solution.

The stainless steel separating tank of the separator is cylindrical in shape with a conical bottom and truncated cone top. A pump violently aerates and circulates the liquid, causing it to froth and foam. The "trash" (nightshade berries, etc.) is floated away and passes through a reel for recovery of the solution.

The Key Co. in Milton-Freewater, Oregon, which makes the equipment has set up specifications for the oil. It is a light, highly refined, odourless, colourless, water white mineral oil of 49-50·5 A.P.I. gravity and 0·777-0·784 specific gravity, 170-180°F. flash point, 185-195°F. fire point, initial boiling point of 385-395°F., and distillation end point of 485-495°F. The high detergent soap is a sodium lauryl sulphate.

The detergent is made up in warm water before addition to the separator tank and must be added *before* the oil, in order that the oil will emulsify with the water. Further information and full directions for setting up and operating the equipment may be had from the company.

The dewatering reels are usually rotary cylindrical screens, but they may be rectangular vibrating screens. They are used between various operations to separate the peas from flume water, Key separator solution, or other liquids.

The washing reels are usually rotary, cylindrical screens, similar to the dewatering reels. Sprays or sheets of water play on the peas as they travel the reel.

After blanching, the peas are distributed on a conveyor belt for visual inspection and the removal of any which are damaged or discoloured.

Size grading

The usual graders in canneries in this district are of the familiar, long, slowly revolving, perforated, cylinder type, the cylinder being made up of sections having holes of different diameters. Or the sections, that is the cylinders, may be nested. A flat screen grader has also been used, but proved less satisfactory than the cylindrical form, according to one canner. The smallest size opening is 9/32 in. in diameter and the largest 13/32. No. 1 size peas drop

through the 9/32 in, holes and No. 5 through the 13/32 in. holes. The diameters for other sizes are 10/32, 11/32, and 12/32 in., for Nos. 2, 3 and 4 sizes respectively.

In some cases blends of two or more sizes are made, such as No. 1 plus No. 2, or No. 3 plus No. 4 size. The No. 7 size, if too ripe, may be discarded or used for stock feed. The small sizes are less mature and sweeter. In one cannery near the end of the season size grading was omitted, as the peas of the variety used were of fairly uniform size. For freezing, grading, beyond removal of No. 7 size peas, is usually omitted; the No. 7 peas are considered too mature for freezing.

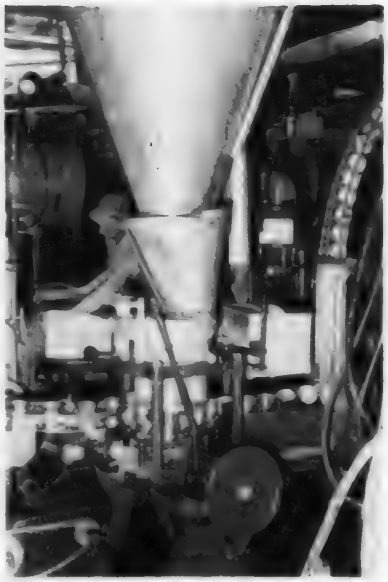
Blanching

A blanch of 3 min. at 190-210°F. is common for peas of average maturity and size. One plant, for example, was using 210°F. for 2 min. and 10 sec. in 1955; another, 3 min. at 200°F.; another 3 to 6 min. at 200°F., the time depending upon the maturity of the peas, and another used 185-190°F. for 3 min. Blanchers are of the usual pattern.

Blanching not only cleanses the peas, particularly of "dried-on" viner juice, but also expels air from the tissues, which if not removed before canning would lower the vacuum in the sealed cans. It also collapses the peas somewhat and thus promotes uniform fill-in and cut-out weights. It does not "set the colour." Water should be soft, as hard water containing calcium or magnesium hardens the peas.

It has been recognised by research workers that the blancher may become an important source of contamination of the canned product with heat resistant bacteria. In the 1954 and 1955 annual reports of the research laboratories of the National Canners Association, the following findings and recommendations are given.

Previous N.C.A. studies indicated that growth of thermophiles occurred on the inner surfaces of the blancher above the water line, and had shown that if these inner surfaces could be held at 160°F.



Automatic can filler for peas and cut corn. The peas are delivered in a measured volume from travelling cups.

or above, contamination was greatly reduced or eliminated. Aspirated cold air caused the observed low temperatures. Closing the flues with dampers caused an elevation of at least 30°F. in the coldest sections of the blanchers. In the three types of blanchers studied, the temperature in the coldest sections was held at, or above 170°F., by closing the dampers in one or both flues and contamination was eliminated. When the flues were opened again the blanchers again became highly contaminated after a few hours operation.

In one type of blancher much of the surface of the discharge mechanism is exposed to cold air. By spraying the surfaces with hot water, contamination at this point has been eliminated. It is concluded that the beneficial effect is not due to elevation in temperature, but to washing away of scum and debris.

Where tubular blanchers are used it has been found that the reels into which the blanched peas are discharged for separation, and the recirculated blanch water, are the main sources of contamination. Spraying the reel and blanched peas with chlorinated water greatly reduces the count of thermophilic flat-sour spores.

In 1955 15% of spoilage occurred in incubated canned peas from blanchers in which the temperature at some points was within the growth range of thermophiles. No significant spoilage occurred in canned peas from blanchers built or modified according to N.C.A. recommendations. It is recommended that a blanching temperature of at least 195°F. be used. Continuous injection of steam inside the blancher hood, near the feed end, aids in maintaining a safe temperature in the hood and reduces contamination.

Cold water sprays to wash the surface of the discharge chute outward also reduces thermophilic contamination at that point. The use of cold water sprays for washing the hot blanched peas in the take-out reels is also effective.

The N.C.A. studies on pea blanchers have been repeated with green bean blanchers with similar results. The Food Machinery Corpn., of San Jose, Calif., now builds a blancher that meets the N.C.A. recommendations.

Quality grading

This operation consists in passing the blanched peas through a small tank of brine of certain density, usually 38° salometer. Concentration is controlled and maintained by an automatic controller, which admits saturated brine as needed. The water adhering to the ingoing peas dilutes the brine continuously. The more tender, higher quality peas float and the more mature ones sink. Both are removed continuously and pumped or flumed to dewatering reels and are then thoroughly spray washed to remove adhering brine. If additional segregation of the "sinkers" into standard or B grade and sub-standard peas is desired a second brine separating unit with strong brine can be used.

If necessary, inspection and sorting of the peas both before and after blanching may be employed, but more often this is done after blanching only.

Can filling

The cans are filled automatically by the machine shown in one of

the photographs. They are conveyed into a large conical hopper which feeds a smaller conical hopper from which the peas flow by gravity into travelling measuring cups, which in turn deliver a measured volume of peas into each can. The cans traverse a circular path around the filler and are delivered to the briner.

Brine is added by volume by an automatic machine. It enters the cans at about 160°F., and as previously indicated drops to about 130°F. by the time the can reaches the double seamer.

The brine used in canning is similar in composition to that used in other pea canning regions. In one plant it consisted of 19 lb. of highest quality salt and 35 lb. of cane or beet sugar per each 100 gal. of water; in another it was 16 lb. of salt and 32 lb. of sugar per 100 gal. of water. The salt must be very pure and as nearly free as possible from calcium and magnesium salts, as these harden the peas.

No exhaust boxes were seen. Common practice was to fill the cans with hot brine, at 160°F., and to double seam by the steam flow method, or under vacuum. The brine drops to about 130°F. by the time the can is double seamed.

The most common can size is the 303. Few No. 2's were seen. Some picnic and 8 oz. and many size 10 cans are used. All are lined with C enamel, which prevents formation of black specks or deposits of black iron sulphide.

Retorts

In the Green Giant plant in Dayton vertical retorts, placed in a circle and serviced by an overhead circular track for conveying loaded baskets to and from the retorts, are used. Several canneries use large horizontal retorts with tracks and cars. The bottom of the car during filling rests on an air lift; as soon as a layer of cans is complete, the bottom is lowered by an amount equal to the height of a can, and another layer of cans is added. This is repeated until the car is full. In unloading the air lift is used again, this time to raise the cans one layer at a time.

Retort car with hydraulic lift. The cans are fed straight from the seamer into the car. As soon as one layer is full the lift is dropped the height of one can.

The temperature in the retorts is controlled and recorded by automatic temperature recorder. Controllers such as those of Foxboro, Tagliabue or Taylor companies are used. One plant uses a continuous FMC pressure cooker for 303 size cans, the cook in 1955 being at 248°F. for 15 min. Retorting times and temperatures for still retorts have been given in an earlier section.

Water re-use

Mercer and Townsend of the National Canners Association made an exhaustive study of the repeated use of the water in pea canneries of the Pacific Northwest, and have issued Bulletin 31-L of the N.C.A., 1954, on this subject. In the Blue Mountain pea producing region water is not plentiful; hence, any feasible and practicable means of reducing the amount of water used in the plant is of great importance. In some localities the municipal sewage system is overtaxed in taking care of liquid wastes from canneries. Re-use of water in the canneries can reduce the volume of such waste. It has been estimated, according to Mercer and York, 1953, that about 100 gal. of water is generally required per case of No. 2 cans of peas. A cannery that packs 200 tons or about 20,000 cases of peas per day would use, on this basis, about 2 million gal. of water daily. Mercer and York state that it is possible by re-use of water by the system that they recommend to cut the water requirement as much as 50%, or in this case to 1 million gal. of water daily.

Use of water can also be reduced as pointed out by Mercer and Townsend by use of low volume, high pressure sprays for washing, by cooling peas with sprays of cold water in a reel, instead of by fluming, elimination of excessive overflow from supply tanks, use where feasible of mechanical conveyors in place of flumes and the use of automatic shut-off valves on water hoses. The re-use of circulated, chlorinated cooling water is a common practice that reduces water requirements in the Blue Mountain canneries.

Re-use of water by recirculating it in a single operation results in rapid pickup of organic matter and possibly in rapid, dangerous increase in spoilage organisms. Therefore, the N.C.A. investigators recommend a counter-flow system of re-use, since in it build-up of thermophiles is avoided and the last fluming of the peas is in clean, fresh water. The water from this operation is collected and passed back for use in successive fluming operations.

In a typical 4-stage re-use system the water from fluming the peas from the quality graders to the final inspection belts is collected in a tank and used a second time in fluming the cooled, washed peas from the blanchers to the quality graders; it is used a third time in fluming the peas from the size graders to the blanchers and used a fourth time in pumping the peas from the washers to the size grader. At the collecting tanks enough fresh water is added to maintain constant over all volume. The re-used water is screened to remove hulls of split peas and other debris. Volume of water

drawn from the tank is also automatically controlled. In the cooling of the hot peas after blanching fresh chlorinated water is employed and is not re-used. Spray cooling was found to be several times more efficient than flume cooling—that is, it required only a small fraction of the water.

Other points in water re-use as given by the N.C.A. researchers are as follows: the fresh water used in the last fluming of the peas, namely, to the final inspection belt, is chlorinated to 5 p.p.m. at the in-plant chlorinator. After each re-use the water is re-chlorinated enough to satisfy the demand of the organic matter for chlorine and give a residual of free chlorine of 0·10 to 0·50 p.p.m. Overflow at the collecting tanks is unnecessary and should be prevented, as it is wasteful. Recirculation of water in the same flume should not be used, for reasons previously given. Peas after blanching should be cooled to not above 100°F., otherwise the brine in the quality graders may be warmed and permit growth of thermophiles. Regular and rather frequent chlorine determinations must be made on samples of water taken at the several re-use stages. A competent employee should be assigned to watch carefully and control the re-use system. No evidence was found that proper re-use by the counter-flow system caused a hazardous increase in thermophilic spores. Blanchers, as previously indicated, were the principal source of thermophiles. In periods of high input of peas the fluming water carries a large load, and therefore picks up more dissolved solids and debris than during normal or sub-normal input. Chlorine in reasonable concentrations has no deleterious effect on the peas flumed in chlorinated water. Chlorine in the concentrations recommended has a great preventive effect on total numbers of bacteria but no measurable effect on the numbers of thermophile spores. Pumping the peas still hot from blanching should be avoided; when pumping is necessary the peas should not be above 80°F.

For further discussion see N.C.A. Bulletin or National Canners Association Information Letter, No. 1426, of February 23, 1953.

Waste water disposal

In the Blue Mountain region the usual method of disposing of the waste water from the canneries is by spray irrigation. It may be piped to a field planted with alfalfa where, by movable surface pipe and spray nozzles, it can be spread by sprinkling. It is pumped under fairly high pressure to the spray nozzles. When one area has been irrigated sufficiently the pipe is moved to another location. The entire field is irrigated several times during the season. Portions of the field may be temporarily fenced in by movable, single, electrically charged wire carried on steel stakes and cattle allowed to graze on the alfalfa for several days before transfer to another area of the field.

Some of the alfalfa may be cut for hay for winter feeding with the pea vine ensilage mentioned earlier. Some companies use the water to irrigate their own fields of alfalfa, whilst in other cases, such as that of the Birds-Eye freezing plant, the waste is utilised by independent growers. The water must be screened at the plant to remove peas, hulls, and trash that would would plug the sprinkler nozzles.

TO THE EDITOR . . .

Degrees Absolute

SIR,

On page 407 of the September issue of FOOD MANUFACTURE a foodstuff is referred to as being "More or less sterile!" This appears to me to be a most unfortunate expression as surely sterility is one of the three absolute states, the other two being virginity and death!

W. H. PIERCE, M.I.BIOL.
Chief Bacteriologist,
Oxo, Ltd.

We should blush to be caught writing "almost unique," but we are (more or less) unrepentant about the phrase to which Mr. Pierce objects.

After all, the word sterile in this context means free from living organisms, and few foods—including even canned meats—are completely free from dormant bacteria. Had we said "more or less free from living micro-organisms," this would probably have passed without comment. It is not always realised that even official sterility tests are strictly valid only for the samples tested and not for the whole bulk.

We feel hardly competent to discuss the other two states mentioned by Mr. Pierce, but we suspect that neither may be as absolute as he thinks.—EDITOR.

Clean Bottles

DESPITE other systems of marketing which have recently come to the fore, the number of glass bottles which are returned to breweries, dairies, and other establishments each day to be cleaned and re-filled must reach almost astronomical figures. The problems involved in the correct washing and sterilisation of this enormous volume of glassware are by no means simple, and it is useful to find a book* devoted entirely to this subject. The author deals fully with all methods of bottle washing, from simple hand operations to fully mechanised processes. The various machines available are described, and chapters are devoted to the correct treatment of washing water and the selection of the most suitable detergents.

* *The Cleaning and Sterilisation of Bottles and other Glass Containers.* United Trade Press, London. Pp. 224. Illustr. 20s. net.

Primitive Man's Preserved Meat

By G. E. Fussell, F.R.Hist.S.

I SUPPOSE there was a time when eating was a feast followed by a fast. The feast followed a successful hunt and nothing was saved. The fast probably lasted longer, either because the chase did not catch up with the game, or the seasonal migrations had not been closely enough pursued.

The lesson of economy would soon be learned by people living in these conditions, but it would be useless saving some part of the slaughtered animal if the meat only decomposed and became uneatable, though early man could no doubt eat meat in a state that would poison us. In some places any meat left on the carcass would dry naturally, and primitive man learned by experience that this would happen. He began to expose his spare meat to the atmosphere in regions abutting on the desert or in the mountains. This gave him a store of dry meat for use when fresh meat was lacking.

It was an easy step—or seems so now—to proceed from this natural drying by sun and wind to drying strips of meat over a fire. This is a very ancient practice, as the fragments of dried meat found by archæologists in ancient Sumeria, in Egypt, and far away from these places in North and East Mongolia, show some of these fragments of meat were certainly dried before storing in the places where they have been found, but nothing can be learned, of course, of the methods used by the ancient peoples who prepared these stores. Nor of those of the lake dwellers in Europe who left fragments of dried meat behind them, to be discovered thousands of years later.

Fortunately, the preparation of dried meat was general throughout North and South America when Europeans first got there; and indeed the methods of the Stone Age Red Indian were adopted by the exploring and trading white man. The Indians had to use whatever they could get, and fish as well as flesh was dried and stored. In the far North the caribou was hunted, and occasionally a musk ox was killed. Salmon was caught and dried on the west of the Rockies, southwards to San Francisco. The prairie Indians, as everyone knows, lived on the bison. The inhabitants of Eastern Canada and New England lived on deer and moose, and further to the south a few bears were killed, besides deer.

The earliest record of the process was made by a Spaniard in the first half of the 16th century. The Mexicans (Aztecs?) dried bison meat in the sun in strips cut as thin as a leaf. After it was dry the meat was ground up into meal. For use it was boiled, swelling in the process. When eaten it was seasoned with fat that was probably preserved in a bladder.

Smoke drying

If the sun and wind would not dry the meat quickly enough it was dried in the smoke of the fire. Three hundred years after Castaneda the business was carried on in the same way. The Kaw Indians then made an annual hunt in a district near the Arkansas River, laid in a large supply of dried meat and returned home for the harvest. The whole tribe was employed on the job, and the whole village was surrounded by drying meat. It had been cut into long narrow strips, as thin as stone knives would cut it, and wound round sticks standing upright in the ground, or laid over a rack of wicker work under which slow fires were kept burning.

Meat dried in this way was hard on the teeth, though few Indians suffered from dental caries. Nevertheless, the dried product was usually pounded into small fragments and put into skin bags. Stone hammers or wooden clubs were used to beat the meat, often contaminating it with stone chips, etc. The crushed meat was packed into skin bags for transport and storage. One bison cow yielded about 45 lb. of dried meat after this process.

Dried meat by itself was apparently difficult to swallow, and moistening it with water only made it worse. Fat was therefore stored so that a small piece could be added to each mouthful. Bison bones were collected, broken and boiled and the marrow fat was extracted. Some could, of course, be extracted by hand, but most of it had to be boiled out. The skimmed fat was put in buffalo bladders for storage.

Pemmican

Eventually, at least by some tribes, the fat and the lean meat were stored together, the resulting product being pemmican; dried meat by itself was called "jerky," a corruption of a native word. When marrow fat was added to the meat it was sweet pemmican, but ordinary hump fat, skin fat, etc., was also used. Caribou pemmican was made in this way as well as that of bison meat. Later, fruit, wild cherries and so on were added to give different flavours, but this was either a white man's novelty or it was done to meet a feminine demand in the tribes.

Fish pemmican was made of salmon. The fish was dried, soaked and crushed fine in stone mortars. This product was either stored as it was in baskets, or fish fats were added to make pemmican. Seal oil was sometimes available, but the sturgeon provided the main supply of fish oil.

Eskimo methods

In the north, half-dry meat was prepared. This was mainly made from the caribou. The carcass was boned and the side was hung out to dry. The heat of the sun caused the meat to harden on the outside and form a skin that was airtight. The Eskimos improved upon the process. They sliced the caribou

meat thin and this was dried in the open air until an airtight skin was formed. This meat was moist inside and did not grind readily for storage in the skin bags. The Eskimos got over the difficulty by chewing it instead of grinding it before packing.

Much of the pemmican contained a high proportion of fat, well over 50%. Indeed, some of the white hunters and so on, who lived upon it just as the natives did, liked as much as 80% fat. This must have formed a very sustaining food, and is said to have been very appetising. The men who ate it were, of course, engaged in what would today be called "heavy work."

The Indians packed their pemmican in nearly uniform sizes. When the skin bags were being filled they were flattened to six or seven inches thick in order to give them a rectangular shape when cool. It is easy to see that this made for ready storage and facilitated packing for transport.

When white men first began to explore the country as fur traders, hunters and settlers they were forced to live on the natural resources they found. The Indians had been doing just that for centuries, and the white men very wisely adopted their methods. Dried meat of one kind or another was the staple diet of the hunting Indian, and came to be a large part of the staple diet of the white men who first travelled the American continent. They were perhaps only doing what primitive man had also done in ancient Europe, Asia and Africa.

The authority for this article is to be found in an essay by Edward N. Wentworth, "Dried Meat and Early Man's Travel Ration," Agricultural History (U.S.A.), Vol. 30, Jan., 1956.

FOOD TECHNOLOGISTS' ANNUAL MEETING

OVER 130 papers covering various aspects of American food technology were read at the Institute of Food Technologists' 17th annual meeting in Pittsburgh recently. Papers were in 16 sections: meat, poultry, fruit and vegetables, frozen foods, radiation, fermentation, enzymes, dehydration, bacteriology, antibiotics, chemicals in foods, statistical quality control, objective quality measurement, industry and education, waste disposal and general. In addition a symposium on the methodology of sensory testing was held.

Beef. Pigment changes in packaged beef during storage were described by Paul C. Pirko and John C. Ayres. Surface discolorations were measured by means of reflectance spectrophotometry and were associated with oxidation or oxygenation of myglobin. Exposure of fresh beef to air for 25 min. before packaging did not alter pigment interchange. Other papers in the meat section included reports on reflectance spectral studies of meat pigments, container problems associated with the addition of phosphates to the curing ingredients of pork products, the effect of certain phosphates on the water holding capacity of meat and the effect of various additives on the stability of cured meat.

Poultry. A paper on the poultry section (by W. L. Mallmann, L. Dawson, B. Sultzer and H. Wright) described tests on predicting the shelf life of dressed poultry. A colour test dependent upon the reduction of a nutrient medium was used, which allowed the rapid growth of psychrophilic bacteria but suppressed the growth of mesophilic bacteria. Other papers in this section dealt with the problem of green rot in eggs—including a description of an automatic detector—and on the flavour of broilers.

Tomato juice. Experiments in which the viscosity of tomato juice was doubled and even trebled by removing the soluble components were described by R. T. Whittenberger and G. C. Nutting. For example, viscosity was increased from 230 apparent centipoises to 700 cp. by washing on a fine sieve. The authors showed that high viscosity was associated with the cell wall fraction of the juice. The commercial significance of these findings is being explored.

Frozen food. An investigation of the time-temperature tolerance of frozen foods was the subject of four papers in this section, which covered frozen fruits, vegetables and poultry.

Antibiotics. Papers dealing with the preservation of poultry and fish with the tetracyclines, not unnaturally formed the subjects of most of the papers in the antibiotics section. They included a report on new methods of preslaughter administration of antibiotics by E. M. Sacchi, J. R. McMahan, R. C. Ottke and C. L. Wrenshall.

Waste. Food from municipal wastes was discussed by Robert V. Morse in the waste disposal section. He described the Rahn process using municipal sewage and whey (both waste products) with algæ which can produce 40 high protein crops per year with nutritional benefits to men and reduction of the cost of waste disposal.

Other papers in this section described practical applications of waste disposal in handling poulty wastes, dairy wastes, and the problems in brandy stillage in a municipal waste treatment plant.

Radiation. Studies on the effect of ionising radiations on foods were reported in the radiation section, which included a paper on the effect of combined heat and radiation treatments on bacterial spores.

The authors, B. Kan, S. A. Goldblith and B. E. Proctor, found that when pure cultures of spores were irradiated, increasing doses of gamma radiation resulted in increased sensitivity to heat. It was also shown that the heat sensitivity of spores of a putrefactive anaerobe mixed into a ham purée was increased by prior gamma irradiation.

Cider. The preparation of canned carbonated cider from dessert varieties was described by

(Concluded opposite)

The Use of Vacuum in the Manufacture of Spaghetti

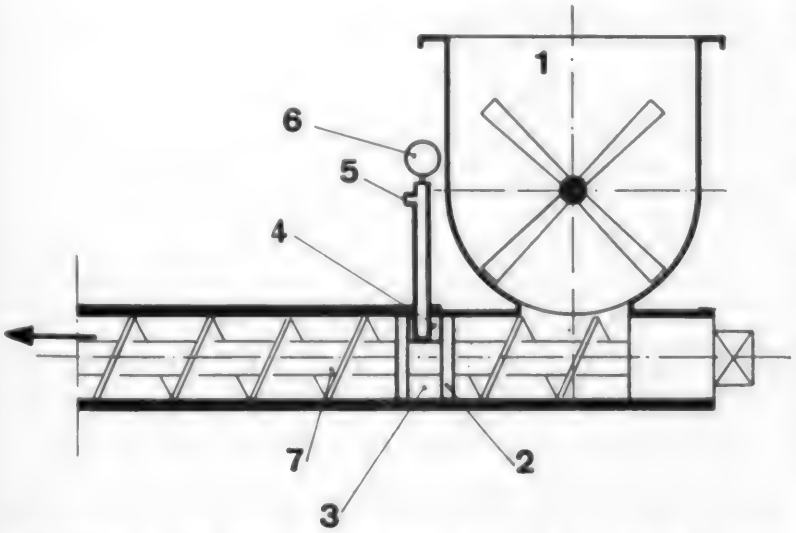
IT has been shown that the removal of air from the dough used in the preparation of spaghetti and other *pâtes alimentaires* by exposure of the pastes to vacuum before extrusion improves the colour of the product and its mechanical properties. During the normal mixing process, a good deal of air is incorporated in the dough, and the bubbles of air in the dried product weaken its structure and detract from its appearance. By mixing under reduced pressure occlusion of air is prevented and the product benefits accordingly.

In practice, however, the application of an effective degree of vacuum presents considerable difficulties, and these have prevented its wide-scale use. It is necessary, for instance, if the mixing trough is to be subjected to vacuum, to provide air-tight sluices for the introduction of the raw materials and the removal of the wet dough. Again, the trough must be covered and windows must be provided for visual inspection of the dough, since samples can no longer readily be taken. These windows will themselves tend to become rapidly obscured by the wet dough, so that the problem of controlling the composition of the paste is a very real one. Another difficulty is that dust from the dry ingredients is drawn into the tubes through which vacuum is drawn, so that these frequently become clogged; in extreme cases, this dust may even get into the vacuum pump itself, with costly results.

In an effort to overcome these difficulties, Buhler Frères, of Paris, have designed a machine in which the vacuum is applied not in the mixing trough but in a special chamber which connects this to the screw press. The wet dough is conveyed from the mixing trough to this chamber by means of a small subsidiary screw conveyor, the dough itself making a seal to prevent the access of air. The vacuum chamber is equipped with revolving blades, which break the dough into small pieces to facilitate the removal of air. It is claimed that this also ensures a more even feeding of the pressing screw.

Advantages claimed for the machine are that it enables the mixing operation to be carried out in an open trough in the usual way and that subjection of only the wet dough to vacuum eliminates the dust hazards. The speed of the subsidiary conveyor can be adjusted independently, so that the rate at which the dough is fed to the vacuum chamber and screw press can be varied at will. The paste is exposed to the influence of the vacuum from the time it enters the vacuum chamber until it is extruded from the machine.

Buhler Frères have also devised a vacuum system which they say is suitable for addition to existing machines. In this case the vacuum is drawn directly on the pressing chamber. Some shortening of the effective length of the pressing screw is necessary, but it is claimed that any difficulties arising from this can be overcome by adjustments to the speed of the screw or to the extrusion plate. The cost of conversion of existing machines is said to be small.



Mechanism for drawing vacuum on the pressing chamber. It can be fitted to existing machines. 1. Mixing trough. 2. Rotors. 3. Vacuum chamber. 4. Guide plate. 5. Connection to vacuum pump. 6. Vacuum gauge. 7. Pressing screw.

Food Technologists' Meeting

(*From opposite page*)

F. E. Atkinson and J. F. Bowen, in the fermentation section. They said that an acceptable cider containing 4·25% alcohol by volume has been prepared from the juice of Delicious apples, sweetened with apple concentrate and presented results of tests with a number of strains of wine yeasts, effects of types of concentrates on flavour and suitability of dessert varieties.

Dehydration. The dehydration section heard a paper on "Advances in Vacuum Dehydration in the United Kingdom" by S. W. F. Hanson. He described the effects of compression and of accelerated storage tests on dehydrated vegetables, and in the case of meat and fish, studies on the newer development of freezing pre-treatment in relation to its effect on the quality of the final product. Other papers described the freeze-drying of fruits, the production of a pineapple juice powder, dehydrated cooked meat products and the quality of dehydrated peas in relation to maturity.

Advances in Food Technology

COFFEE

Infra-red Drying

It should now be possible to dry coffee grains spread out on a vibrating table by infra-red irradiation. Preliminary tests have been successful, but, in order to obtain the best possible results, it is still necessary to carry out research into certain chemical, physical electrical and mechanical aspects of the matter. In particular, it would be necessary to investigate, by means of a generator to be built for the purpose, whether irradiation of certain wave-lengths could adversely affect the taste of the coffee. A trial installation might then be tested on a semi-industrial scale.—A. Bérard, *Industries Alimentaires et Agricoles*, 1957, **74**, 369.

MEAT

Prepackaging Study

A five-year study of factors affecting the quality of prepackaged meat has recently been made at Rutgers University, U.S.A., and results are now being published. This article deals with the effects of storage on the organoleptic characteristics of the various samples studied. During the tests several types of cured and uncured meat were packed in cans and in different kinds of transparent film, and stored at 34° and 40°F. At intervals of up to 28 days samples were examined for raw colour, odour, and general appearance, and for cooked flavour, odour, tenderness, and juiciness. The samples packed in cans were used as controls.

In general, it was found that better flavour and total organoleptic quality were shown after storage by those samples which were heat-sealed under vacuum in films having relatively low oxygen and water-vapour permeability. Of the films studied, vinylidene copolymer (*Cry-O-Vac*) proved to be one of the best, with a cellulose-*Pliofilm* laminate, used with the *Pliofilm* innermost, and an MSAT 80 cellulose film, used with the coated side innermost, also giving good results.

A cellulose acetate-pliofilm laminate (*Pliofilm* inside) and a cellulose-polyethylene laminate (polyethylene inside) were also generally satisfactory.

As was to be expected, better results were obtained after storage at 34°F. than after storage at 40°F. There appeared to be no consistent difference, however, between results obtained on samples of meat packaged in the fresh state and on samples of the same meat held in a frozen state (−9° to −15°F.) for about three weeks before packaging. The presence or absence of light during storage also proved to be without significance in the case of fresh meats, although cured meats kept their colour better when stored in the dark.—W. E. Clauss, C. Olin Ball and E. F. Stier, *Food Technol.*, 1957, **11**, 363.

FISH

Moisture Determination

A rapid method for the determination of moisture in fish and fish products has been described by Russian scientists. A sample of the material weighing from 3-5 g. was placed between two metal slabs and warmed by an electric current to from 130-150°C. After drying for about 3 to 5 min. the sample was cooled and weighed. It was found that the best temperature of drying for fresh, salted or smoked herring and for red herrings is 150°C., time for drying 55 min. The difference from the standard method was from −0·59 to +0·48%. The time taken for the two parallel determinations was 35 min.—I. M. Marshak and S. N. Mizikin, *Rybnoe Khozyaistvo*, 1956, **3**, 34-37.

SARDINES

Holding Condition and Quality

A study has been made on the quality of Yugoslav sardines (*Clupea pilchardus*, Walb., the true sardine), held frozen and unfrozen immediately prior to canning and during a shelf life of the canned product of about 1½ years. The sardines were caught in the months of June, July and August.

The results led to the conclusions that sardines should be iced in boxes within two to three hours of catching in a manner which prevents crushing. Fish handled in this manner should be held no longer than three days in unfrozen storage before canning. Evisceration of sardines before storage is not necessary once these conditions are observed. After the sardines are cooled and stored at 30-31°F., the presence or absence of ice over the fish does not affect its canning quality.

Only very fresh sardines, iced and handled as above, should be frozen for later canning. Glazed and unglazed air-frozen sardines can be held at a temperature of −4°F. in a condition acceptable for canning up to one month. A storage temperature of about −20°F. is recommended for use in commercial practice.

Organoleptic examination of the fish flesh both before and after canning is recommended to give a proper assessment of quality.—W. A. MacCallum, *et al Food Tech.*, 1956, **10**, 9, 432.

▶Specification sheets covering a range of transducers, the associate power units, and the simple analogue computers have been issued by Evershed and Vignoles, Ltd. The transducers covered are those for flow, pressure, differential pressure and level. Evershed state that further specification sheets are in the course of production and they hope that all their range of process control equipment will be adequately dealt with.

Machinery and Equipment

PRINT REGISTRATION UNIT

A new print registration unit for butter, biscuit and other wrapping machines has been introduced by Radiovisor Parent, Ltd., which, they claim, is more compact and yet retains the technical standard of their previous equipment.

The unit, type *PR* 56, comprises a control unit including a plug-in chassis which may be removed without disconnecting any incoming wiring, and a scanning head. The latter incorporates a dual optical system with the photo-electric cell and projector lamp fixed in a predetermined relationship which, say Radiovisor Parent, gives a sensitivity equal to that of their larger equipment.

POWER TRANSMISSION

New power transmission equipment shown by Crofts (Engineers), Ltd., at the Engineering, Marine, Welding and Nuclear Energy Exhibition at Olympia include an *Airflex* dynamometer, shaft mounted gear units, and new worm reduction gears.

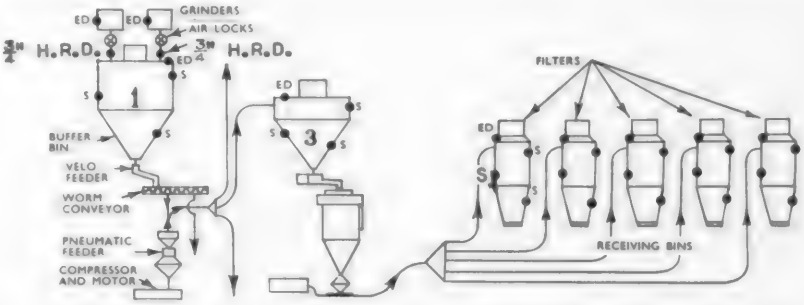
The dynamometer provides the load in a working demonstration of the pick-up and stall characteristics of Croft's new *Hydroflex* drives. These drives are also represented by a pulley-type drive for right-angled power take off by V-ropes and a direct coupled type for in-line shafts.

A new series of shaft-mounted gear units in 18 sizes to provide power outputs up to 120 h.p. was displayed.

The worm reduction gears include interchangeable units of 4-in., 6-in., and 8-in. centres which can be changed from standard left hand to right hand assembly in a minute or so. Another new design is a small double reduction worm gear with three types of detachable feet to facilitate universal mounting. Four sizes are available of 1½-in. × 1½-in., 1½-in × 1¾-in., 1½-in. × 2½-in., and 1¾-in. × 3-in. centres.

Crofts also displayed a new flexible coupling, said to be able to transmit twice the power of its predecessor, and new self-driven conveyor pulleys. In these pulleys, all the driving mechanism—electric motor and speed reduction gearing—is housed inside the pulley itself.

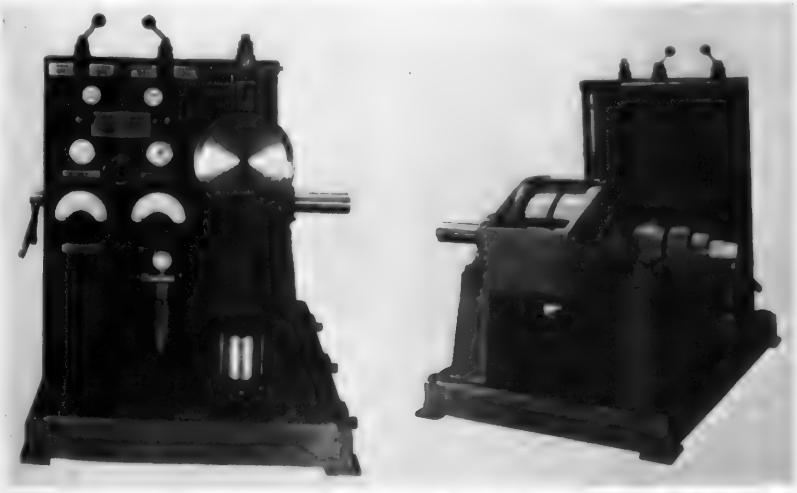
Exhibits of apparatus in current production included examples of the company's clutches, conveyor equipment, double helical gearboxes, flexible couplings, machine-cut gears, *Ritespeed* geared motors and reduction gears, *Taper-Flushbush*, V-rope, *Powergrip* and chain drives, variable speed drives and worm gears.



Graviner explosion prevention in a pneumatic handling plant for flour or sugar. The protection system is divided into a number of sections: (a) *grinders,* (b) *buffer bin,* (c) *service bins and* (d) *receiving bins, which are treated as independent explosion risks. Each grinder is provided with an explosion detector* (*ED*) *which, in the event of an explosion in the grinders, would initiate the operation of the high rate discharge bottles* (*HRD*) *below the rotary gate valves. This would inert the ducting and prevent a secondary explosion or fire in the buffer bin. As the buffer bin is provided with its own suppression system an explosion originating in this vessel would be brought under control by the hemispherical suppressors* (*S*) *in the bin. The service and receiving bins also have independent suppression systems.*

EXPLOSION PREVENTION

The rapid detection and suppression of explosions by the use of their equipment is claimed by the Graviner Mfg. Co. The principle depends upon detecting rapid changes in pressure. An explosion of a mixture of hydrocarbon and air, or (as in most food factories) of inflammable dust and air, starts as a small expanding sphere of flame, and when it occurs in a confined space the pressure reaches a maximum when all the inflammable material has been burned. Graviner use an explosion detector in which a snap-action diaphragm containing a small bleed hole is contained in a rubber diaphragm, and a suppressant—*e.g.*, chlorobromethane. The bleed hole in the detector is not large enough to equalise rapid changes in pressure, and if they occur the diaphragm snaps over and closes an electrical contact which fires a detonator releasing the suppressant. Graviner claim that this would happen within 5 to 10 milliseconds at a pressure of less than 3 p.s.i. The sup-



Crofts air-actuated dynamometer showing (*left*) control panel and (*right*) "Airflex" brakes and torque bracket.

pressant is generally ejected from hemispherical containers or from high rate discharge bottles and, in addition to extinguishing the explosion flame, it inerts any unburned explosive mixture.

"Advance inerting" is another method used by Graviner, in which a secondary explosion is prevented by introducing the suppressant into a section of the plant away from the seat of the explosion. Allied to this method is isolation: shutting off one section of the plant from another by means of a detonator-operated high speed isolation valve. In a typical valve, a spring-loaded flap is held open by a small hollow cylinder housing a detonator. When the cylinder is fractured by the detonator the flap snaps into the closed position.

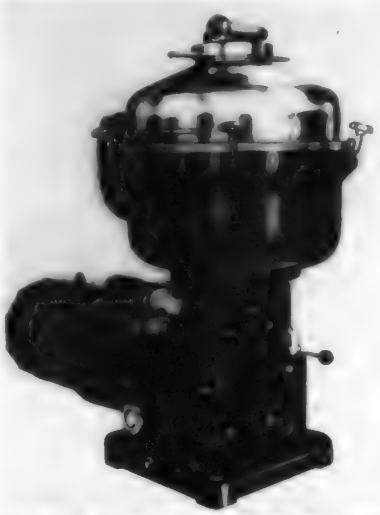
For explosion prevention by venting —when the explosion is allowed to exhaust itself to atmosphere—Graviner supply detonator-operated bursting discs which operate at predetermined pressures. These discs are said to be unaffected by normal temperature or pressure fluctuations.

The electric power unit controlling the Graviner explosion protection unit incorporates a relay which automatically shuts down the plant immediately an explosion occurs.

SAFER V-BELT

A new V-belt produced by J. H. Fenner and Co., Ltd., is claimed to be not only heat-resisting but also flame-proof. The belt, which has its jacket anchored through to the pulling cords by synthetic rubber, is called the *Premium* V-belt. Safer drives in explosive or inflammable conditions and longer life in working conditions of 120°-180°F. are among the features claimed for these belts.

Other advantages claimed for the belt are oil-resisting properties, and the incorporation of compounds which allow the static electricity generated to leak away.



The new De Laval BRM 214 hermetic beer clarifier.

BREWERY PLANT

This APV "Fox" bottle filler and crowner will be shown for the first time at the Brewer's Exhibition. The model here, a "Speed 40" Model "H," is in operation at Bents Brewery. It is said to have a capacity of 12,000 bottles per hr., and will be connected up as a unit with an APV "Paraflow" beer pasteuriser. Other exhibits by APV will include a display of external attemperation for fermenting vessels; an illuminated diagram illustrating continuous wort boiling; a yeast degasser and the "Rosenblad" spiral heat exchanger.

Heat-resistant and flame-proof V-belt.

BREWING MACHINERY ON SHOW

Several new machines are being displayed by the Alfa-Laval Co., Ltd., who are exhibiting for the first time at the Brewers' and Allied Traders' Exhibition (Olympia, September 30 to October 4). A De Laval beer clarifier, type *BRH* 214, which has a throughput capacity of 60 barrels per hr. on top-fermented beer or 90-120 barrels per hr. on lager beer, is on show for the first time in this country.

A second new centrifuge, described as an automatic self-opening clarifier for beer wort, type *BR-PX* 300, automatically ejects sludge while running at full speed. It is claimed that there are no shutdowns for cleaning, so that beer clarification is placed on a fully automatic basis. Among the other equipment which is being shown by Alfa-Laval is a *defoaming pump* for frothy liquids which separates air and pumps de-aerated liquid in one operation.

STAINLESS STEEL CLAD ROLLS

A new, patented process for the external cladding of rolls, shafts, tubes and drums has been introduced in Great Britain by Rose, Downs and Thompson, Ltd.

This process, which is used mainly to clad equipment with stainless steel, has been proved on the Continent and is claimed to overcome the difficulties encountered with other methods.

The bonding between the cladding and the foundation is said to make separation impossible and to ensure complete resistance to corrosion without altering the physical properties of the sheet metal cladding. Subsequent machining of the cladding, including the cutting of keyways, is possible, and the preparation of the foundation body before cladding ensures that only a minimum machining allowance is left.

The close bonding effected by this method ensures a high rate of heat transfer, and rolls and shafts protected by this method are claimed to be suitable for working in temperatures between −40°C. and 300°C.

Hard finishes can be applied to the clad rolls by the electro-deposition of chromium.

News Digest

Night baking in Scotland

The Minister of Labour states that the Scottish baking industry will not be subject to the Baking Industry (Hours of Work) Act, 1954, which is due to come into operation next January. The Act regulates night work in bakeries.

New Scottish creamery

The condensery section of the Aberdeen and District Milk Marketing Board's new creamery at Bucksburn should be in use by the end of this year. The creamery itself should be completed by the end of 1958 and will cost £600,000. It has been designed to handle between 40,000 and 50,000 gal. per day and will ultimately replace the present Kittybrewster plant.

Italian confectionery drive

The Motta organisation, said to be Italy's largest confectionery manufacturers, are to promote a big sales drive in Britain this year.

The lines which are being promoted are marrons glaces, glace fruits, baby macaroons, cocktail cherries and a wide selection of other products. The campaign is being conducted by a Motta demonstration van, which has been visiting leading wholesale confectioners and grocers in the London area.

Modern sausage factory

Dalziel Co-operative Society, Ltd., has opened a modern sausage factory at Albert Street, Motherwell. It supplements their older plant, which has been closed down for modernisation, leaving the new unit to handle the trade. The plant is modern in layout and is designed to provide a range of sausages and meat products. Dalziel has been interested for some years in the development of pre-packaging trade for their self-service units, and the modernisation of the factory is designed to prepare the way for the ultimate development of a centralised meat packing plant which will feed the retail units.

Fluorescent tube guarantee

Users of Osram standard straight fluorescent tubes in the range of 1¼ ft. to 8 ft. are being offered free replacement for any new tubes which fail before 3,000 hours or one year of use—whichever is the shorter.

Sir Hugh Beaver at Corrosion dinner

At the Corrosion Convention dinner to be held at the Waldorf Hotel, Aldwych, W.C.2, on October 15, one of the principal speakers will be Sir Hugh Beaver, K.B.E., president of the Federation of British Industries and managing director of Arthur Guinness, Son and Co., Ltd. He will propose the toast "The Fight Against Corrosion."

The chief guest at the dinner will be Mr. Harmar Nicholls, M.P., Parliamentary Secretary to the Ministry of Works.

The Corrosion Convention is being organised by the Leonard Hill journal, *Corrosion Technology*, as part of National Anti-Corrosion Week, October 14-18. The Convention will open on October 15, at Central Hall, Westminster and continue for two days.

The other principal event of the week, the Corrosion Exhibition, will be opened at 12.30 p.m. by Mr. Harmar Nicholls on October 15, and continue for three days. The venue is the Old Hall of the Royal Horticultural Society, Vincent Square, Westminster, London, S.W.1.

Application forms for attending the Convention and tickets for the Exhibition are obtainable from:

The Convention Organiser,
Stratford House, Eden Street,
London, S.W.1.

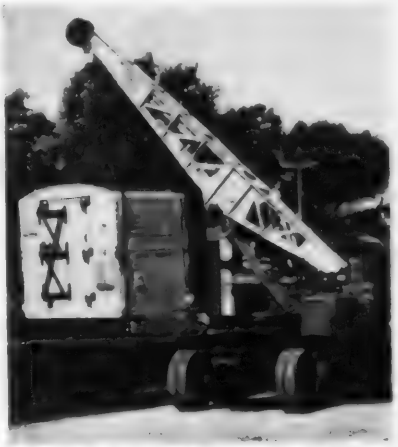
Transport fleets merge

Vine Products, Ltd., and Britvic, Ltd., have solved their transport problems by merging their road fleets. The new arrangement is reported to have led to significant improvements in distribution.

The two companies have switched almost completely from rail to road transport. Beaufoy's Wines and Spirits, Ltd., another company in the group, also use the new service.

Nine area depots have been set up, from which distribution fleets will operate, in important centres in England, Scotland and Wales. V.P.'s and Britvic's London and home counties deliveries are being made from both the Kingston depot, and from the Britvic factory at Chelmsford.

Head of the joint fleet is Mr. E. W. Russell, group transport manager, who is assisted by Mr. R. Figgins.



Emphasis is placed on hygiene and weight saving in the new insulated food containers designed by British Railways.

Frozen food containers

British Railways are increasing their fleet of 3-ton insulated containers to help cope with the growing amount of frozen food which is being carried by rail. The first of 200 of these insulated containers, designed by British Railways and built by Park Royal Vehicles, Ltd., are now coming into service.

The containers are made largely of timber but are lined with *Plymax*, a steel-faced plywood made by Venesta, Ltd. The metal surfaces of this are placed innermost, and are soldered at the corners to give an unbroken metal lining on the inside of the containers. Insulation is provided by a thick layer of expanded rubber material, and hooks are provided for the suspension of bags of solid carbon dioxide as a further safeguard against rise in temperature.

Vegetable milk

A milk product for those who are unable to digest animal fat of the type contained in ordinary milk or who are suffering from heart and artery disease has been introduced by Alfonal, Ltd., and will shortly be released in a part of London through Mortlock's Dairies. Known as *Alfona*, it is a separated milk product said to contain special vegetable fats of high iodine value.

New British sherry

Vine Products are launching a cream sherry called R.S.V.P. It is made from Spanish grape juice and will retail at 7s. 6d. a bottle and at 4s. a half bottle.

ERECTIONS AND EXTENSIONS

Metal Closures, Ltd., Bromford Lane, West Bromwich, are having a factory built at Tipton, Staffs.

*

British Sugar Corporation, Ltd., are planning to extend their factory at Boroughbridge Road, York.

*

Needler's, Ltd., manufacturing confectioners, have plans in hand to build a warehouse and garage in Hull.

*

Bilsland Brothers, Ltd., have plans in hand to build an extension to their bakery at Whitehall Street, Glasgow.

*

Coventry Pure Ice and Cold Storage Co., Ltd., are planning to build factory premises on a site at Queen Victoria Road, Coventry.

*

Tip Top Bakeries, Ltd., have had plans prepared to build extensions to their bakery at Orpington, Kent, at a cost of £35,000.

*

Warburtons, Ltd., bakers, Back-o'-th'-Bank, Bolton, are planning to build a bakery on a site at Manchester Road, Bolton, Lancs.

*

Cadbury Bros., Ltd., cocoa and chocolate manufacturers, Bournville, Birmingham, are planning to build a distribution depot at Exeter, Devon.

*

J. G. Turney and Son, Ltd., distillers, Glasgow, are having an extension built to their bottling factory and store at York Street, Glasgow, C.2.

*

J. Storey and Son, Ltd., mineral water manufacturers, have had plans drawn up for the erection of a bottling factory and warehouse in George Street, Newcastle-on-Tyne.

*

Westburn sugar refinery in Greenock has been given Dean-of-Guild approval for a conversion costing £11,000. This will allow bulk handling of sugar at the refinery, linking up with bulk handling at the docks.

*

Welma Bakeries, Ltd., are proceeding with plans to demolish their existing buildings at Crownpoint Road, Glasgow, S.E., and erect a new bakery, dispatch and garage building on the site, plus a two-storey extension to their office premises off Coulter's Lane, Crownpoint Road.

COMPANY PROFITS AND PROSPECTS

Heinz profits up

A dividend of 32% is maintained by H. J. Heinz and Co., whose net profit reached £2,196,291, against £1,951,550 for the year to April 27, 1957.

*

Unilever profit down

Net profits for the first half-year for Unilever, Ltd., and Unilever, N.V., are estimated to be £3 million less at £19·4 million than those for the same period of last year. This is in spite of an increase in the turnover, which rose to £846 million for the first half of the year, as against £813 million for the corresponding period of 1956.

*

Yeast factory closed

The Distillers Co., Ltd., are to close their Vauxhall yeast factory in Liverpool, to effect economies in production. Discussing this in his annual statement, the chairman, Sir Henry J. Ross, said that production would be concentrated at the other three factories. He also announced that in spite of increasing competition, sales of fats, edible oil and margarine made by the Peerless Refining Co. (Liverpool), Ltd., had continued to rise.

The net profit of the group amounted to £22,452,798, an increase of £2,141,368, approximately 75% having been derived from their interests in Scotch whisky and gin. The total dividend for the year was 18¾%, an increase of 1¼% over last year.

*

Concentration boosts Beecham earnings

Reviewing the year's activities, Lord Dovercourt, chairman of Beecham Group, Ltd., stated that the improvement in the trading profit was largely due to the substantial increase in the profit of Beecham Foods, Ltd., where the benefit was now being felt from concentrating their various food interests in one company.

The sales of soft drinks in the past year had reflected the poor summer weather, although the sales of *Lucozade* had picked up towards the end of the year. The crop of blackcurrants had been poor, but this had been slightly compensated for by the good crop of garden peas.

The chairman hoped that *Sun-Orange Quosh* would prove to be a successful addition to their soft drinks range. On the confectionery side, *Murraymints*, backed up by substantial advertising, had proved to be very popular. Total home sales of the group's products amounted to £18,494,537, of which £8,755,034 had come from the sales of their foods and beverages.

The trading profit of the group was £4,516,123 compared to £3,665,808. A final dividend of 12¼% making a total of 32½%, was recommended.

*

Agreement cuts sugar income

The revised incentive agreement with the Government had resulted in a lower income from that source, stated Sir Edmund Bacon, chairman of the British Sugar Corporation, at the annual general meeting, but benefits accruing from their programme of modernisation and expansion carried out over the past few years fully covered this reduction in revenue.

Apart from their own operations the main event of the past year had been the passing of the Sugar Act, 1956, which had resulted in the sugar trade being freed from Government control.

The trading profits were little changed at £2·35 million against £2·30 million. The Board raised its dividend from 5% to 5¼%.

*

"Corona" expansion programme

Factories are in course of erection at Bolton and at Southampton and developments and extensions are planned in other areas, said Mr. W. D. James, chairman, when he spoke at the annual meeting of Thomas and Evans, Ltd., who produce *Corona* soft drinks.

Early results in the South Lancashire area, where two factories, one at Manchester and one at Blackburn, had been erected, had proved to be encouraging.

Sugar prices in the past year had resulted in a lower price margin, while sales of soft drinks had been maintained at the same level, and in the grocery section the profits earned were satisfactory.

A final dividend of 10%, less tax, was paid, making a total of 12½%, less tax.

Quality control symposium

A joint symposium of the Food Group of the Society of Chemical Industry and the Association of Public Analysts on the "Quality Control of Food," will be held at the Royal Society of Medicine, 1, Wimpole Street, London, W.1, on Thursday and Friday, October 3 and 4. The statistical features of quality control will be emphasised. The theme will be to indicate by examples from current practice and theoretical consideration how the application of statistical methods helps or might be made to help the food manufacturer to control the quality of his products, to enquire how it might assist the public analyst in the establishment of more definite standards of quality, and to show how it facilitates the assessment of the customer's response.

PEOPLE

Dr. Margaret Wright.

DR. MARGARET D. WRIGHT and MR. D. W. BICHENO have been appointed joint deputy managing directors of Vitamins, Ltd. Dr. Wright joined the company in 1932. She was responsible for starting the company's Experimental Station at Walton Oaks for servicing the animal feeding industry. She also conceived the project for the pharmaceutical and fine chemicals factory at Crawley, which is now directed by Mr. Bicheno. A newcomer to the Vitamins Board, which he joined in 1955 as production director, Mr. Bicheno is 42.

■

MR. E. G. ALEXANDER has resigned as joint managing director of Harvey's Belgravia Foods. He will continue as a director in a non-executive capacity.

■

MR. W. S. PORTEOUS has been appointed a director of Rowntree and Co. He has been in the service of the company since 1946 and has been advertising manager since 1950.

■

MR. ERIC ROLL has been appointed as full-time director of the International Sugar Council. He took the appointment up last month. He has been seconded from the Civil Service, where he was an Under-Secretary in the Ministry of Agriculture.

■

MR. RICHARD M. CAMPBELL has been made a director of Spesco Developments, Ltd., manufacturers of polythene wrappings and containers. He is already a director of Gresham Lion Group, Ltd., Gresham Transformers, Ltd., and V.I. Plastics, Ltd.

■

MR. L. E. HODGE (45), formerly assistant chief accountant, has been appointed chief accountant, and MR. J. A. K. BLADES (30) has been promoted assistant secretary to Batchelors Foods, Ltd. This reconstruction follows the death of MR. J. BAMFORD.

MR. L. G. LELLIOTT has been appointed general manager of T. Wall and Sons (Handy Foods), Ltd., manufacturers of packaged bacon, canned meats and canned foods. He was formerly a sales executive with T. Wall and Sons (Meat Products), Ltd.

■

MR. JOHN C. MACFARLANE has been appointed assistant general manager of the Scottish Co-operative Wholesale Society flour and allied departments. Mr. MacFarlane has been with the S.C.W.S. for all his business life and has served in the various mills at Leith and Glasgow.

■

MR. W. A. FLINT has left Electrothermal Engineering, Ltd., to join the sales promotion department of The Drayton Regulator and Instrument Co., Ltd., to handle publicity. Previously Mr. Flint was with Sunvic Controls and Westinghouse Brake and Signal Co., Ltd.

■

MR. H. MCLEOD WARD, director, Dollar Food Products, Ltd., and MISS HILDA NOBLE, director and secretary, Thomas Symington and Co., Ltd., coffee essence manufacturers, will be among the group representing the Edinburgh Chamber of Commerce which will travel to Canada in October on a mission to help develop Edinburgh's export trade to North America. It is expected that the bakery equipment trade will also be represented in the group.

The mission will also establish business contacts in Montreal and then fly on to Toronto.

■

Obituary

MR. RONALD M. L. FRANCIS, managing director of National Adhesives, Ltd., died on August 27, a few hours after being removed to hospital following a cerebral hæmorrhage.

■

MR. JOHN REGINALD CUTTELL, dairy development engineer of the A.P.V. Co., Ltd., died on August 28 at the Queen Victoria Hospital, East Grinstead, at the age of 54. He was well known in the dairy industry, having served the firm for the past 29 years.

■

MR. JAMES MCCREA, a well-known figure in the sugar trade in the west of Scotland, died recently in Greenock. Mr. McCrea, who was 82, joined Westburn Sugar Refineries, Ltd., as a clerk in 1900 and rose to become joint managing director.

He retired about 18 months ago, but retained his seat on the board of directors.

OBITER DICTA

● The ministers concerned will have their hands full trying to digest the children of the first socialist revolution.—*Economist*.

● Sir Bernard Spilsbury used to say that he could always tell the practised beer-drinker by the large, pale and greasy liver.—*The Lancet*.

● Everyone seems to be hankering for an apple as big as a basket ball. What is wrong with the lunch-pail size we have got?—*Dr. Seymour Shipiro, Brookhaven*.

● Would it be bad if we spread a little butter on the teachings of Marxism-Leninism? I say well-buttered Marxism-Leninism would taste even better.—*Mr. Krushchev*.

● In shops over here eggs are not dated, and don't seem to be refrigerated at all. In fact, they are often left sitting outside the grocer's door in the sun. I once complained about this and drew the reply from the grocer: "Well, the sun won't be out very long."—*American housewife in Britain*.

● When Prince Charles arrives at Cheam School tonight his tuck will be quite distinctive—mostly soft-centre chocolates wrapped in gold tinfoil and every one stamped with a chocolate "C." That "C" will ensure there is no mistake in the little room Cheam calls "The Bank" where the tuck is stored.—*Daily Mail*.

● For some years now I have refused to buy the sweet bright red glue sold as jam, and I am pleased to hear that others have done likewise. Fresh strawberries and sugar boiled together make jam—the result has a brownish tinge and is delicious. No colouring matter is necessary unless the jam is made for morons or cretins.—*Reader's letter in Manchester Guardian*.

● The pubs—short for public-houses or bars—are typically British. There is a well-varnished mahogany bar, shining wood and copper beer-handles, dark panelling, sawdust on the floor and a parrot squabbling in a corner—with a pure English accent! You can drink all the varieties of English beer and watch the dart games. The players are inspired by the tankards of ale they swallow down with a gracious toast to the health of the Queen.—*Air France Year Book*.

Food News Overseas

Malayan palm oil factory

The Sultan of Selangor recently opened a new $1·5 m. palm oil factory near Klang. With equipment supplied by the Dutch firm of Stork, its initial output will be 5,000 tons of oil a year rising to 9,000 tons.

Burmese rice mill

Rice experts have under consideration the erection in Burma of a modern rice mill on the Rangoon river. This is a pilot project intended to produce better quality rice and to introduce the mechanical loading of rice for export in place of manual labour.

Sugar refinery for Honduras

A second new sugar refinery is to be erected by the Cia. Azucarera Hondurena in the San Pedro Sula area of Honduras. It is to be fully automatic and even more modern than the first, which has been operating very successfully for over a year. The company has requested a loan of 1 million dollars from the Export/Import Bank, and it seems likely that the contract for building the factory will go to the U.S.A.

Brazil expands food industries

Meat: Exports of meat from Rio Grande do Sul to Europe are improving. Exporters have signed contracts with Germany, Holland and Portugal.

Milk: Two representatives of the General Milk Co. of America visited Brazil recently, to investigate the possibilities of producing canned milk there.

Oil: Soya bean oil is now being produced at the new factory set up in Porto Alegre, Rio Grande do Sul, Brazil, by Merlin de Oleos Vegetais Ltda. The factory is equipped with German machinery.

Rum: It is reported that the Bacardi Co. of Cuba intend to install a factory to produce rum in São Paulo. It will be the largest of its kind in Brazil.

Pineapple problem

The Formosan pineapple industry is worried by a falling-off of orders from Western Europe. In the case of the United Kingdom this is attributed to the operation of Commonwealth preference, while in West Germany Hawaiian canned pinapple is thought to be gaining ground at the expense of Formosan.

Meanwhile, a new cannery has been opened at Taitung by the Taiwan Sugar Corporation. More than half of the United States aid which has been given to the pineapple industry (more than U.S. $1 m. between 1952 and 1955) has gone into this cannery, which is claimed to be the "best in Asia." The production increase for the industry, laid down by the new Four Year Plan, is 46% by 1960.

The U.K. has now resumed imports of large quantities of Malayan pineapples, according to a statement made in Singapore by Mr. Yap Pheng Geck, chairman of the Central Board of Pineapple producers of Malaya.

At the beginning of the year, the U.K. market for Malayan pineapples had been threatened by the competitive prices of the Australian and South African packers, with whom Malayan producers have now reached a better understanding.

Anhydro reorganisation

Anhydro A/S, whose spray driers are handled by Leonard Smith (Engineers), Ltd., in the U.K., have recently reorganised their business in Copenhagen.

Mr. K. J. Jensen, the founder of the company, now becomes chairman, ceasing executive responsibility for day-to-day activities but remaining as technical consultant. This enables Mr. Jensen to give more of his time to technical matters concerning Anhydro A/S, also the increased activities of their associated company, Lidano, who produce the more specialised milk powder products. The two companies share the same offices in Copenhagen, therefore Mr. Jensen remains available at the same address.

Mr. K. P. Berthelsen has been appointed managing director, after having held the position of technical manager since the company was started. Mr. M. E. Knipschildt and Mr. Paul Jensen, have been appointed managers of Anhydro.

Indian sugar packers to adopt metric system

The Development Council for the Sugar Industry has recommended that the metric system should be adopted in India from November, 1958, the start of the next crushing season.

The standard bag of sugar will contain one quintal (100 kg.), which is about 6 lb. less than at the moment, so that there should not be much difficulty in effecting the change-over.

A sub-committee will be set up to help smooth the change-over and to familiarise cane-growers and workers with the system.

Indian market for milk powder

New milk processing techniques which have been adopted in India could result in a new market for milk powder from Australian producers, according to Mr. J. V. Pascoe, chief chemist of the Sydney Dairy Farmers' Co-operative Milk Co., who had recently returned from an assignment as technical adviser to the Bombay milk scheme. He said that a large pasteurisation and bottling plant had been established there and the powder would be required as a base for a product known as "toned milk." Milk was produced by buffaloes and was either sold as whole milk or converted to the product known as "toned milk" by the addition of skimmed milk powder and water. This product still had a good fat content, and its consumption now exceeds that of unmodified milk.

The skimmed milk powder had to be imported, and the Australian dairy industry was closely watching the expansion of this industry, Mr. Pascoe said.

Sugar and rice plan for Kenya

A large-scale project for the growing of sugar and rice as part of a £7 million scheme for irrigation and swamp reclamation in the Kenya Nile basin is reported by Barclays Bank D.C.O.

A report has been submitted to the Kenya Government by a firm of consulting engineers. Nearly 30,000 acres of the 54,000 acres considered suitable for irrigation are part of the Kano plain, bordering Lake Victoria, which is the most promising area.

It is suggested that 15,000 acres of sugar should be planted there if a pilot scheme is successful and a £2·5 million factory is envisaged.

30,000 ton sugar refinery

The Glasgow engineering firm of Mirrlees Watson, Ltd., has secured a contract worth £1,500,000 to build a sugar factory in Southern Ceylon. They are to build the complete factory—from the steel framework of the buildings to the machinery inside.

Two Glasgow engineers and one of the firm's directors have been in Ceylon for the past two months. Along with local agents they have signed the contract with the Ceylonese authorities for the construction of the factory in the Gal Oya Valley.

The factory is to begin production in 1959 and will crush 2,000 tons of cane a day. Annual production of sugar will be about 30,000 tons.

Packaging

Four colour film

A heavy duty, heat-sealable transparent film, *Metathene*, which is produced by Metal Box, Ltd., is now being printed in up to four colours. The colour is sealed between the polythene coating and the cellulose film.

Grease resistant coating

A grease resistant coating for paper and board which can be heat-sealed, has been developed by National Adhesives, Ltd. The product is an internally plasticised copolymer known as *National* 37-251 and is one of a range of new products based on polyvinyl acetates.

Internal plasticisation is claimed to impart permanent flexibility without the risk of plasticiser migration or contamination of the product in contact with this coating.

Pickle labels

Fletcher's Sauce Co., Ltd., have introduced a new range of pickles with labels designed by Richard Lonsdale-Hands Associates, Ltd. A basic design has been created which is suited to the different colours of the materials filling the bottles.

The label carries the brand in white shadowed lettering surmounting a panel naming the contents. Each label is distinguished by its background colour which has been arranged to tone with the contents and where the contents of the bottle are similar in colour the colours inside the panel have been varied. Further differentiation has been achieved by the use of two colours for the screw capped jars.

New labels for Fletcher's pickles.

Ham and chicken slicing meat, made by McCall and Co., is now packed in new lithographed tins, designed by the Metal Box Co. These oblong tins are ideal for display, particularly in self-service stores.

Gum-mixer

The *Gum-Gun* mixer, conditioner and dispenser, marketed by the Purdy Machinery Co., Ltd., is claimed to take the guesswork out of preparing gum for use in a labelling machine.

The gum is contained in a steel vessel, with a cover in which there is embodied a funnel-shaped housing for the dispensing nozzle. The gum is fed straight from the container into the conditioning unit which is driven by a ½ h.p. motor. The gum is conditioned by a geared masticator which, it is claimed, will handle any thickness of glue with ease. Incorporated in the machine is a by-pass arrangement, whereby the gum is recirculated through the masticator when the machine is not dispensing, thus ensuring that there is always a supply of conditioned gum. A rigid frame supports the flexible metal hose and the dispensing nozzle is fitted with a full bore control cock. Hand stirring may be employed for starting but this is stated to be necessary only under extreme conditions.

Clip fasteners for polythene bags.

Fastener for polythene bags

Available for the first time in this country is a new plastic fastener for polythene bags which is said to be easily opened and shut again.

Known as the *Poly Clip*, the fastener is a small plastic collar, the ends of which are fastened by a press stud. Protruding from one of the two halves of the inside collar is a large tooth, which, as the collar is folded in two, enters a slot on the opposite side and holds the neck of the bag in a firm air-tight grip. The makers are Sealdraught, Ltd.

Cake piping in tubes

A ready-to-use cake piping, packed in collapsible dispensing tubes, is being marketed by J. Harradine and Sons, Ltd., under the name of *Just Rite* instant piping. The piping is available in four colours—chocolate, yellow, pink and green—and a pack containing one each of the colours retails at 1s. The firm is also offering its widest-ever selection of crystallised dessert fruits, etc., for the Christmas market.

Polythene mesh

A thin polythene sheet reinforced internally by a thin sheet of fibreglass or other suitable textile has been produced by the plastics division of the Telegraph Construction and Maintenance Co., Ltd (Telcon). This results from developments in the extrusion coating technique which they use to manufacture packaging materials in which polythene is applied to paper, etc. *Telcomesh* is said to possess the impermeability and chemical resistance of polythene plus a greatly increased mechanical strength and a fair degree of translucency.

The new product can be used as an outer covering for the transport of large units in cold storage. It is also recommended as a material for conveyor belts in the food and confectionery industries.

New Companies

Albion Cold Stores, Ltd. (587434.) Albion Street, Grimsby. £1,000. Dirs.: O. A. Cleve and F. F. Smith.

C. Bruce and Son, Ltd. (584414.) 6, Northcote Street, Stockton-on-Tees. Mfrs. of and dlrs. in jams, preserves, syrups and honey. £5,000. Dirs.: C., Mrs. E. and J. Bruce.

Castle Produce Co., Ltd. (584983.) 17, Philpot Lane, London, E.C.3. Buyers, sellers, importers and exporters of and dlrs. in canned foods, dried fruit and other foodstuffs. £5,000. Dirs.: N. H. Castle, G. R. S. Haigh and F. R. Finston.

Chorbo Foods, Ltd. (585137.) Rifle Street, London, E.14. Mfrs. of and dlrs. in dog biscuits and animal foods, medicines, etc. £1,000. Dir.: N. F. Lambourne.

Percy Dalton (Essex), Ltd. (584371.) Growers, importers, exporters, shippers, dlrs., producers, packers and canners of fruit, vegetables, etc. £100. Subs.: W. Memery, 85, Gloucester Street, London, S.W.1, L. Dias.

Percy Dalton Famous Peanut Co., Ltd. (584372.) £100. Subs.: W. Memery, 85, Gloucester Street, London, S.W.1, L. Dias.

Dean and Froud, Ltd. (584684.) 8, Commercial Road, Parkstone, Poole, Dorset. Canners of and dlrs. in fruit, vegetables, meat, poultry, etc. £1,000. Dirs.: A. R. H. Dean, C. A. Froud and H. R. Spender.

Flagman, Ltd. (584631.) 31, Kings Road, London, S.W.3. Wine, beer and spirit merchants. £100. Dirs.: W. F. Meier, E. C. Babel, S. S. Gibbins.

Grosvenor Foods, Ltd. (584760.) 71, Saltergate, Chesterfield. £1,000. Dirs.: E. H. and Eileen D. D. Grosvenor.

Emile Just (Pure Food), Ltd. (585267.) 69, Duke Street, London, W.1. Vegetarian food specialists, etc. £1,000. Dirs.: E. Just and L. E. Turner.

Lessiter's, Ltd. (584989.) Mfrs. of and dlrs. in chocolates, sweets, etc. £1,000. Subs.: N. I. F. Benjamin and D. G. Redfern, 8, Ely Place, London, E.C.1.

M. and T. Dairies (West Country), Ltd. (584865.) Savings Bank Buildings, Helston, Cornwall. £2,000. Dirs.: Mrs. O. M. Marks and Mrs. R. Thomas.

L. Minchella, Ltd. (584345.) 221, Prince Edward Road, South Shields. Mfrs. of and dlrs. in ice cream, confectionery, cooked and prepared foods and beverages. £3,000. Dirs.: L. and Mrs. D. M. Minchella.

John Murray and Sons, Ltd. (584288.) Main Street, Haltwhistle. To take over business of a soft drink mfr., stout and cider bottler and ale merchant carried on at Haltwhistle by John A. Murray. £5,000. Dirs.: J. A. and J. S. Murray.

Plastic Packaging, Ltd. (585255.) 40, Wakefield Road, Leeds, 10. Mfrs. of and dlrs. in cartons, containers, wrapping and other forms of packaging made from plastic, etc. £10,000. Dirs.: N. W. Watson, E. B. Barlow and T. N. Gaunt.

Polythene (Bottles and Containers), Ltd. (584522.) 75, Wigmore Street, London, W.1. £100. Dir.: M. B. Conn.

Romsey Fruit Market, Ltd. (584780.) 33, The Hundred, Romsey, Hants. £1,000. Dirs.: S. G. and Mrs. I. M. Cox.

Rugby Dairy (Warwick Street), Ltd. (584898.) 28, Warwick Street, Rugby, Warwicks. £1,000. Dirs.: A. J. and

Frank Roberts of London, Ltd. (586738.) Peninsular House, 28, Monument Street, E.C.3. Importers, canners and packers of, dealers and distributors of and agents for the sale of fruit, vegetables, etc. £5,000. Dirs.: P. N. Hemming, J. E. Pike and F. Roberts.

T. Savage and Co., Ltd. (587273.) Mfrs. of and dlrs. in edible sausage casings. £5,000. Dirs.: J. T. and Mrs. F. Savage.

Southern Packing Supplies, Ltd. (587046.) Nutsey Lane, Salisbury Road, Totton, Hants. £2,000. Dirs.: J. T. Walker and C. M. Wilmot.

Tems Products, Ltd. (587343.) Irwell Street Works, Rosegrove. Mfrs. of and dlrs. in potato crisps, etc. £2,000. T. and E. Monkhouse and S. H. Bowker.

Wallop Packing and Freezing Co., Ltd. (586630.) Brewery House Farm, Middle Wallop, Hants. £4,000. Dirs.: M. and P. Bradley, Z. Ubysz.

Walsall Ice and Cold Stores, Ltd. (587071.) £30,000. Subs.: J. Lord and Mrs. C. A. Cooke.

White Eagle Continental Products, Ltd. (587034.) 9, Walmer Villas, Manningham, Bradford. Salami and sausage mnfrs., etc. £2,000. Dirs.: L. W. Czarnecki, B. Zglinski and T. Podgorski.

J. W. Wilson and Sons (Keighley), Ltd. (586735.) 18, Cook Lane, Keighley. Bakers and confectioners, sugar boilers and manufacturers of and dealers in confectionery, bread, flour, biscuits, etc. £12,000. Dir.: F. Wilson.

Graham Woodhead's (Successors), Ltd. (586744.) 116, Dewsbury Road, Wakefield. Tripe dresser and dripping refiner. £500. Dirs.: G. Cole and L. Lodge.

Yarmouth Fisheries, Ltd. (584537.) £2,000. Dirs.: Naomi D. Collins, 202, West Green Road, Tottenham, London, N.15, D. Collins.

These particulars of new companies recently registered have been extracted from the daily register of Jordan and Sons, Ltd., Company Registration Agents, 116, Chancery Lane, London, W.C.2.

Trade Marks

CHICKSTICKS.—B756,739. Pre-cooked potatoes in the form of sticks. **Kenneth Partington Bromilow,** trading as **B. and B. Products,** Manchester Road, Wingates, Westhoughton, Lancashire.

BELLRINGER.—B757,737. Dried pulses (for food for human consumption). **Woodwards Seeds, Ltd.,** 39, Bell Lane, London, E.1.

FLYING FALCON.—751,430. Wheat flour. **Pillsbury Mills, Inc.,** Minneapolis, Minnesota, U.S.A., c/o Stevens, Langner, Parry and Rollinson, 5-9, Quality Court, Chancery Lane, London, W.C.2.

SILVER STRAND.—762,448. Fresh vegetables and fresh fruit. **Galbraith's Stores, Ltd.,** 53, Back Sneddon Street, Painsley, Renfrewshire.

CORONA ORANGONA.—757,460. Non-alcoholic drinks and preparations for making them, all containing orange juice or orange essence and included in Class 32. **Thomas and Evans, Ltd.,** 24, Hannah Street, Porth, Glam.

OVODAN.—759,375. Eggs, egg yolk and egg albumen, all preserved by drying or freezing. **Dansk Tørreg Fabrik Aktieselskab,** Gersonsvej 7, Hellerup, near Copenhagen, Denmark.

DELECTUS.—759,913. Cooked, canned and preserved meat. **A. J. Mills and Co., Ltd.,** Colonial House, Tooley Street, London, S.E.1.

SPLINTER.—761,667 and **SPRINTER.**—761,722. Dead poultry. **Spinks of Easingwold, Ltd.,** Thirsk Road, Easingwold, Yorks.

GOLDEN HAWK.—764,139. Jams, canned fruits and vegetables. **Eagle Canning Co. (Pty.), Ltd.,** Markhams Buildings, 60, Adderley Street, Cape Town, South Africa.

New patents are from the Journal of Patents and new trade marks are from the Trade Marks Journal. In each case permission to publish has been given by the Controller of Her Majesty's Stationery Office. Each of the publications is obtainable from the Patents Office, 25, Southampton Buildings, London, W.C.2.

COMPANY MEETING

GEO. ADLAM & SONS

Dividend Raised

The 50th annual general meeting of Geo. Adlam and Sons, Ltd., was held on August 16 at Bristol, Mr. W. Walker, J.P., F.A.C.C.A., chairman, presiding.

The following is an extract from his circulated statement:

The accounts now submitted show an improvement in profits earned, mainly offset by taxation, notwithstanding my warning last year of a general change in the nature of the business; this improvement arises partly on the brewery equipment side and partly by a development of contract work on general engineering.

Mr. Young, who joined the company last year as Works Director, has since been appointed Joint Managing Director, which has proved of material benefit to the company.

The company has been able to change its policy so that more of the equipment is being produced in its own works and less from sub-contractors, particularly overseas suppliers. This policy will continue and be further expanded as opportunity offers. The company will, however, continue to incorporate into its complete installations a special plant of other manufacturers where it is considered in the best interests of the customer.

Mr. Young is in charge of production at Bristol, and has already improved the quality and speed of output of brewery equipment, particularly in stainless steel vessels. He is also developing more rapidly the general engineering capacity and output of the company, from which results are expected in the future.

Your Directors feel that progress continues satisfactorily and warrants a slight increase in the dividend to 20%, less tax.

The report was adopted.

Information and Advice

This Service is available to subscribers to FOOD MANUFACTURE. If a stamped addressed envelope is enclosed replies will be sent by post. Enquiries cannot be answered by telephone.

Lemonade powder

B.8103. *Can you supply us with a formula for lemonade powder?* (Brisbane, Australia)

We suggest the following as a basis for trial:

Tartaric acid	1 oz.
Tincture of turmeric	1 dr.
Oil of lemon	20 m.
Sugar	1 lb.

The above are mixed and coloured. The oil of lemon can be replaced by other flavours.

Tomato Sauce

B. 8327. *We should be grateful if you could supply us with a recipe for tomato sauce.* (Christchurch, New Zealand).

A sauce with a high acidity of 3·6%, which for this reason does not require pasteurisation, is described by S. V. Poultney (Vinegar Products). The following ingredients are used:

Tomato purée	40 lb.
Sugar	60 ,,
Malt vinegar	20 gal.
Gum tragacanth	8 lb.
Onion powder	12 oz.
Garlic powder	3 ,,
Salt	7½ lb.
Ground ginger	7 oz.
Ground white pepper	7 ,,
Ground cloves	1½ oz.
Ground cassia	1½ ,,
Ground mace	2 oz.
Ground pimento	1½ ,,
Ground celery seed	½ ,,
Red colour as required.	

The spices are mixed into a cream with a gallon of the vinegar, and the gum tragacanth is made into a mucilage with vinegar in the usual manner. All ingredients are then placed in a pan and cooked for 20 minutes, passed through the colloid mill and allowed to cool before bottling.

Turkish Delight

B.8326. I *should be grateful if you could supply me with a method for the preparation of Turkish Delight.* (Bolton, Lancashire).

The following method is recommended by C. T. Williams. (*Chocolate and Confectionery*, Leonard Hill,, 25s.)

Granulated sugar	37½ lb.
Corn syrup	21 ,,
Thin boiling starch	9 ,,
Honey	4 ,,
Citric acid	6 drs.
Soluble oil of lemon	¼ fl. oz.

Place the sugar and corn syrup in a steam stirring pan with 3 gal. of water, and boil to dissolve the sugar. Mix the thin boiling starch to a thin paste in 1½ gal. of cold water and add it slowly to the batch. Cook at 60 lb. p.s.i. steam pressure until the batch does not stick to the hand when struck. At this point the steam should be turned off and the honey and lemon essence added. When these have been well mixed in, the batch is poured into trays which have been dusted heavily with starch, and corn starch is dusted over the surface of the material. The trays are then stacked in a dry place to cool. When cool, the sheets are cut on a guillotine or by hand knife, and the pieces are copiously dusted with finely ground sugar.

Turkish Delight is always packed in a generous helping of finely ground sugar, which prevents sticking and assists a certain amount of case-hardening of the pieces. An alternative dusting powder consists of 75% ground sugar and 25% corn starch.

This sweetmeat is usually made in two-colour layers. One batch, flavoured lemon, is run into the dusted trays to a predetermined thickness, and a second batch, coloured pink and flavoured with dilute attar of rose, is run on top of the first.

The suspended starch solution must be added slowly, so that complete gelatinisation of the starch takes place progressively. An efficient stirrer cooker is essential in order to obtain uniform heating throughout the mass during the cooking process.

Information supplied

The Enquiry Service has dealt with requests for names of manufacturers and suppliers of plant, machinery and materials, and also general information as follows:

B.8177. *Recipe for lemon curd.* (Manchester)

B.8178. *Recipe for curry powder.* (London, E.C.3)

B.8179. *Information on cooked hams.* (Birkenhead)

B.8180. *Regulations for colouring tomato sauce.* (Dublin)

B.8181. *Recipe for caramel for use in caramel wafers.* (Glasgow)

B.8182. *Suitable fats for frying nuts.* (Ipswich)

B.8183. *Preservation of lemon curd.* (Battle, Sussex)

B.8185. *Advice on registering a trade name.* (Birmingham)

B.8186. *Machine for slicing nuts.* (London, E.C.3)

B.8190. *Manufacturers of frozen food carton filler.* (Moorabbin, Melbourne)

B.8191. *Information on margarine.* (East Brisbane, Queensland)

B.8192. *Importers of fruit for canning.* (Ashford, Kent)

B.8193. *Suppliers of flavouring enzyme.* (Co. Cavan, Eire)

B.8194. *Suppliers of tomato powder.* (London, E.C.3)

Recent Patents

COMPLETE SPECIFICATIONS ACCEPTED

781,599. BREWING PATENTS, LTD., and J. R. A. POLLOCK: Treatment of barley preparatory to malting.
781,620. NORSK FROSSENFISK A/L: Process for producing frozen meat, especially fish.
781,674. VEMAG VERDENER MASCHINEN- UND APPARATEBAU ZWEIGNIEDERLASSUNG DER SUDOSTHOLZ GES. METZ AND CO.: Apparatus for making sausages or similar material.
781,688. KUSTNER FRERES AND CIE S.S.: Wrapping for foodstuffs.
781,709. MIKROVAERK AB.: Foldable moulds for automatic chocolate moulding plants.
777,820. W. D. AND G. MEAGHER: Method of tempering or seeding chocolate.
781,919. P. I. LANGMEAD: Device for testing the moisture content of grain and other compressible material.
782,222. PILLSBURY MILLS, INC.: Cereal composition for moist batters and dough and method of making same.
782,403. A. E. HAUPT: Process for manufacturing sugar for diabetics.

ABSTRACTS OF BRITISH PATENTS

Peanut foods

Oil cakes prepared from peanuts have been used as cattle food principally because they are too unpalatable for use as human food. A method for preparing a food product for human consumption from peanuts is based on the complete removal of the red skins of the kernels.

The kernels are washed and rapidly dried. This cracks the red skins which can then be removed from the kernels by an air stream, after which the kernels are roughly crushed and again subjected to an air stream to remove any remaining skins and the germs. Washing may take place in an apparatus comprising a Archimedean screw, so as to humidify only the red skin surrounding the kernel; drying is commenced in a centrifugal drier and completed in a rotary drier.

The cleaned and dried kernels are then fed to expellers, which by steam treatment disintegrate the cell tissue and oil is extracted in the usual way. Pressure is applied very gradually to avoid any excessive heating.

The cake is reduced to a fine powder by supersonic crushing and roasted for a few minutes at 80° to 120°C. This results in desiccation and re-agglomeration of the product into granules. Amino acids, inorganic salts, sugar, sodium glutamate, salt or certain flavours may be added if required.—780,097. *G. Calil and M. Guernier.*

Paste extruding machine

In a machine for forming extruded products from alimentary and other pasty materials, a pasty mix is passed into a vacuum chamber provided with mixing devices which are adapted to assist deaeration of the mix and to feed it to a number of discharge passages. Each discharge passage houses a helical extrusion screw adapted to press the mix through an extruding die at the outlet of each passage. These extrusion screws are driven simultaneously.

In an embodiment a mixing chamber feeds the vacuum chamber through a feeding passage fitted with an extrusion screw, the passage having a die associated with a rotary cutting device which cuts the mix into small pieces as it enters the vacuum chamber.

The discharge passages are preferably divided into two groups and the extrusion screws of one group so arranged that they can be run independently of those of the other group.

It is stated to be advantageous in carrying out the invention to arrange the discharge passages vertically in two rows, on opposite sides of the vacuum chamber. The vacuum chamber should be provided with orifices in the base, each leading to the passage, and the mixing devices should include shafts, each extending parallel with one of the rows of discharge orifices, and having mixing vanes which as the shaft rotates intersect the line of the said row.—781,213. *A. Benedettelli.*

Technical Press Review

OCTOBER

Dairy Engineering.—Preview of the Dairy Show; Mechanical Equipment for Cheesemaking; Dairy Industry in South-East Asia—2; New Bottle Filling and Refrigeration Plant.

World Crops.—Mechanisation of Tree Food Crops; Rusting and its Cost to Farming; Resistance to Mechanisation; Agricultural Engineers Association; Agriculture in the Soviet Union.

Manufacturing Chemist.—Review of Corrosion Convention and Abstracts of Papers; Review of Corrosion Exhibition; Synthesis of Alkyl Halides; N-Oxides of Pyridine and its Derivatives; Progress Reports; Analytical Chemistry, Cosmetics and Toilet Preparations, Pest Control.

Automation Progress.—Automatic Equipment Produces Electric Motors; Infra-Red Absorption for Process Analysis; Share Registration by Punch Card Machines; Transfer Press Assembly Welds Car Wheels; How to Evaluate a Data Processing System for the Office; Semi-Automatic Testing for Car Engines.

For specimen copies write to Stratford House, Eden Street, London, N.W.1.

Spherical containers for beverages

A spherical, transparent plastic container for carbonated beverages, etc., is claimed to be flexible, non-elastic, non-resilient and impermeable to liquid and gas.

The container is collapsible, is of a size convenient to hold in the hand and is fitted with an outlet tube. The container is filled with a liquid and gas and the tube sealed. If a thermoplastic material is used for forming the tube, it should be heat-sealed. Various types of plastic material may be used in the manufacture of the container.

It is claimed that, because the container is spherical, it will withstand the pressure of the gases, maintain its shape more readily and provide a sturdy and manageable container.—775,217. *L. Peters.*

Confectionery manufacturing machine

Sweets which have a centre of one material and an outer covering of another are made with this machine. The machine has a number of extruding nozzles each of which contains at least one inner extruding nozzle.

Both outer and inner nozzles are provided with the appropriate material from sets of pumps. Each of these pumps has a cylinder containing a piston which draws the material from the source of supply by way of a suction channel and advances the material between each pump and its associated outlet channel.

Valve means are provided for selectively establishing and cutting communication between each pump and its associated channel in timed relationship with the movement of the reciprocating piston of the pump. Actuating members are connected to the pumps from the driving means. The driving means act first upon the actuating member connected to the first pump then upon the second actuating member connected to the second pump, releasing the second actuating member before releasing the first during each stroke. This movement is characterised by stops for limiting the stroke of the second actuating member which is supplying the core material.

The actuating member slides on an operating rod for simultaneously driving the first and second actuating members and spring means connected to the driving means act on the second driving member.

The stops for limiting the stroke of the last-named members may be adjustable and may be adjustable in a manner such that it is possible to limit the stroke of the second members in relation to the first members—780,385. *M. C. D. Niemantsverdriet and P. G. Endeveld.*

Abstracted from the Official Journal of Patents and from published specifications. These publications are available from the Patents Office, 25, Southampton Buildings, London, W.C.2.

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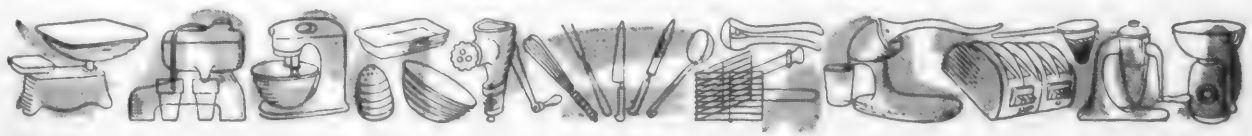

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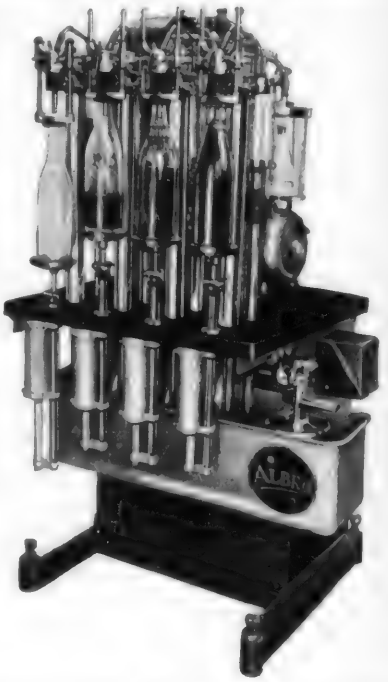

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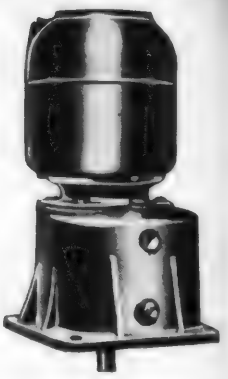

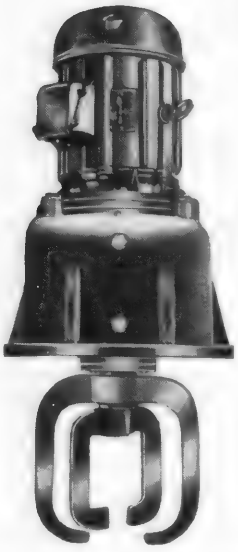

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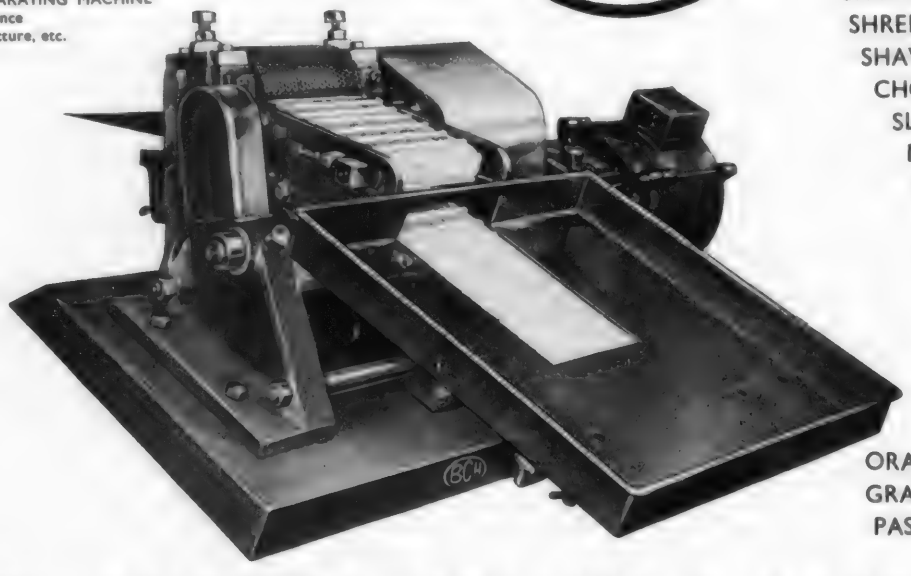

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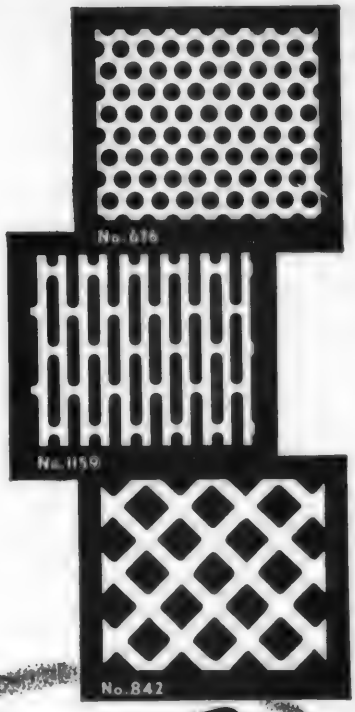

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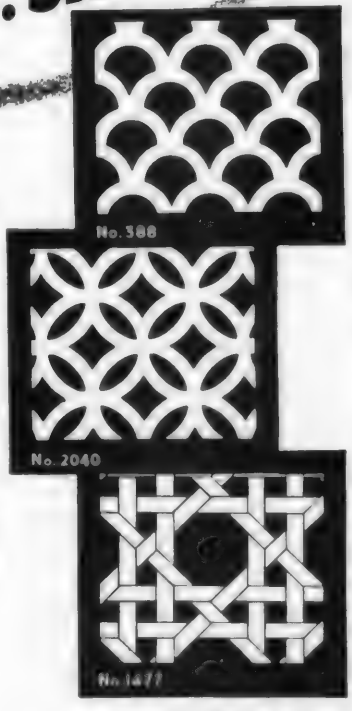

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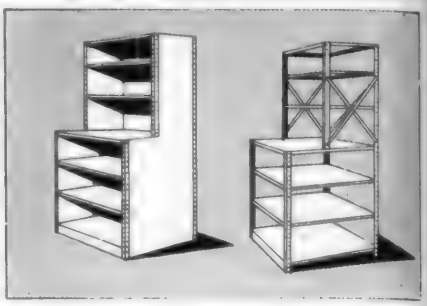

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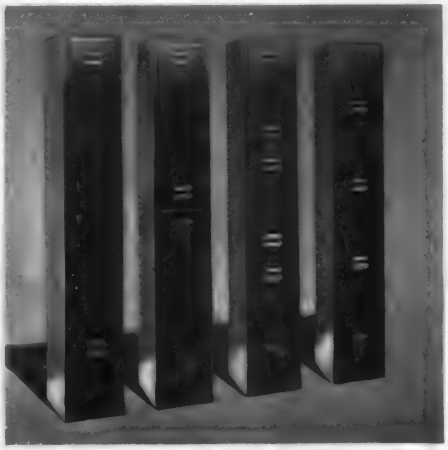

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There is an admission charge of 2s., for members of the general public only. Intending visitors may note that the London Regional Display of the Engineering Industries Association will also be open, at the nearby R.H.S. New Hall, during October 16, 17 and 18.

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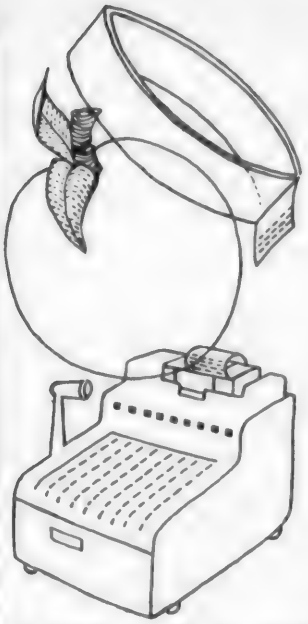
May be obtained by all engineers, or anyone employed in industry, by writing to: The Organiser, Corrosion Exhibition, 9 Eden Street, London, N.W.1. Quantities of tickets will gladly be supplied for the use of associations and technical colleges.

The CORROSION EXHIBITION is organised by the Leonard Hill Technical Group (Publishers of CORROSION TECHNOLOGY, the monthly anti-corrosion journal) as one of the features of National Anti-Corrosion Week. A CORROSION CONVENTION is also being held (full details on application to Stratford House, Eden St., London, N.W.1).

A



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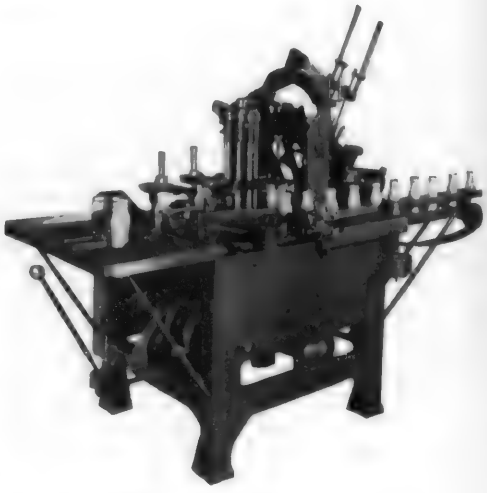

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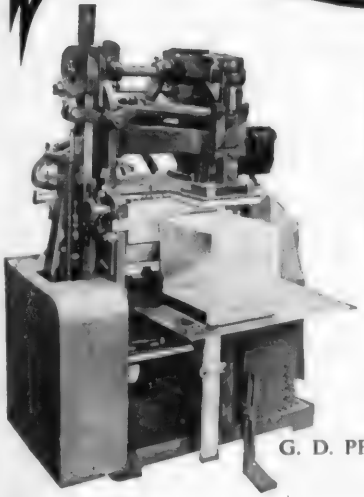

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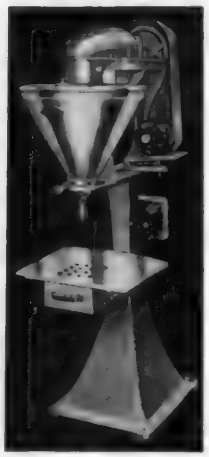

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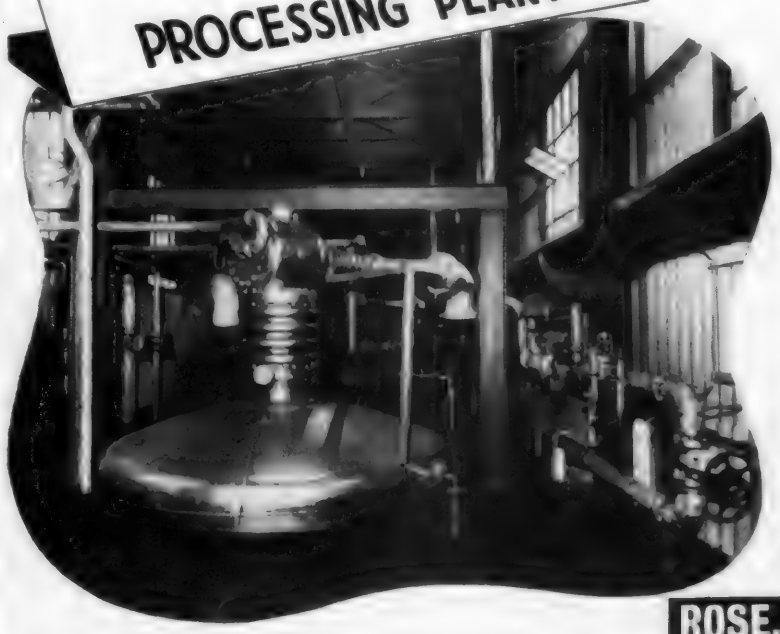

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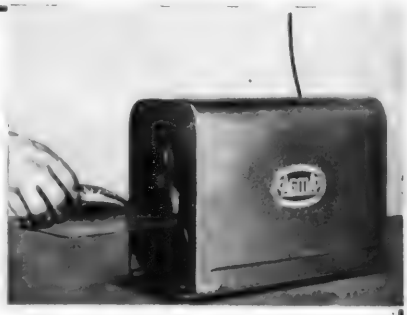

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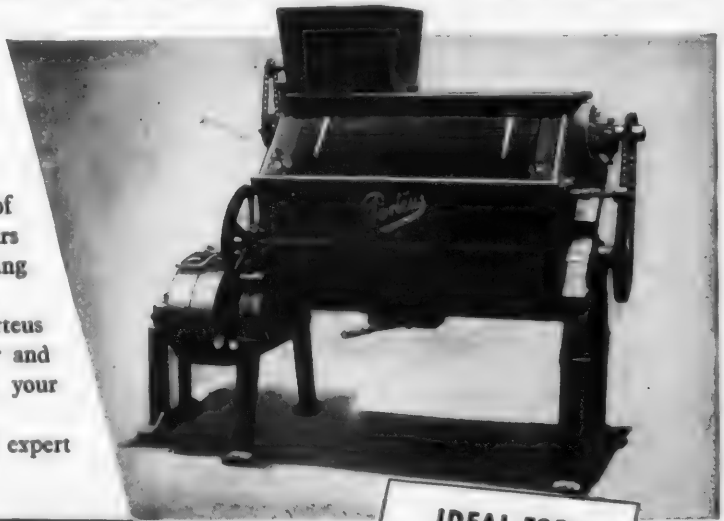

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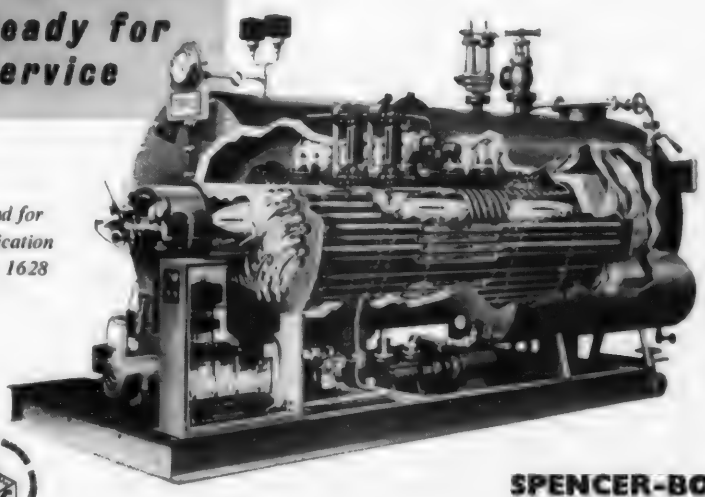

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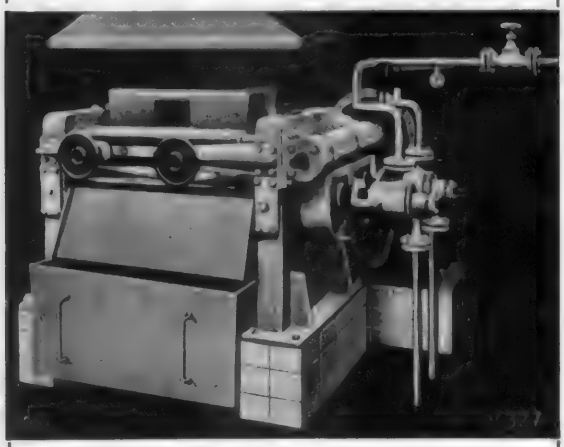

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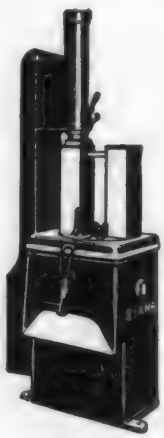

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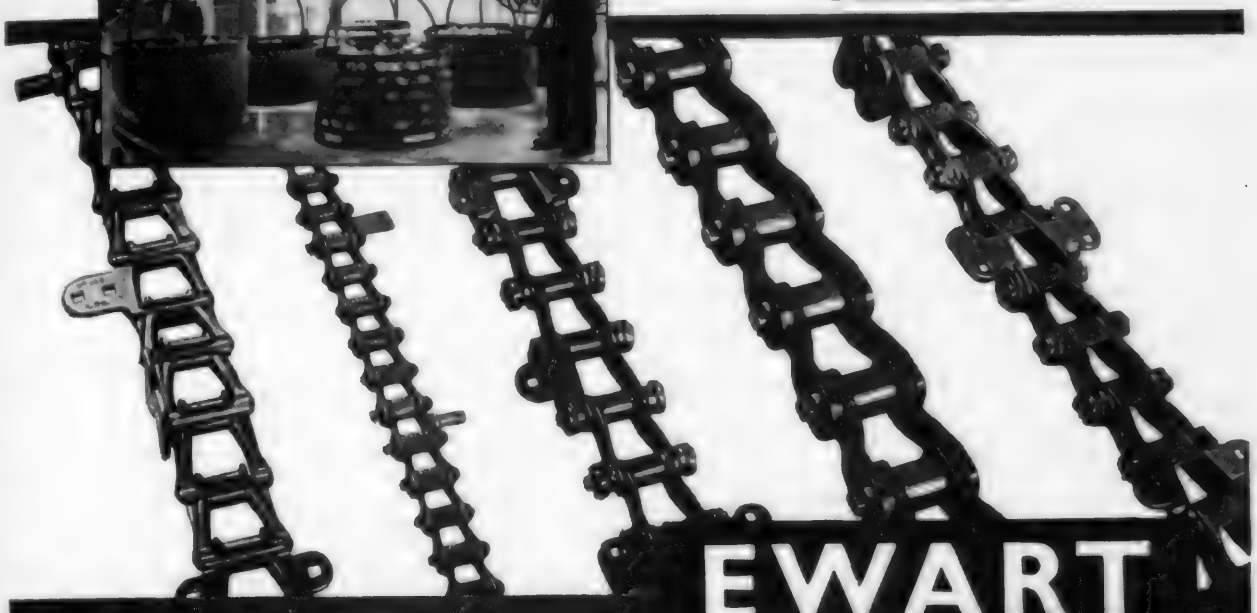

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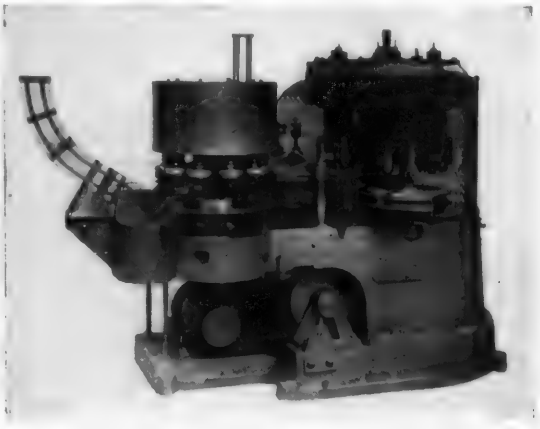

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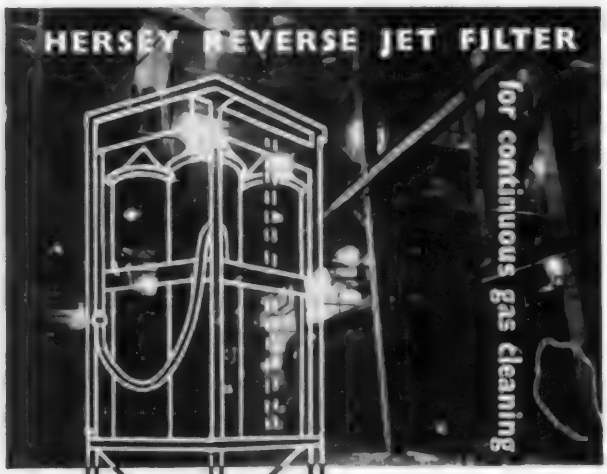

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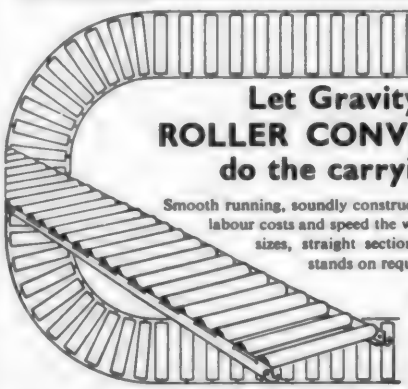

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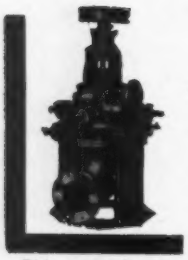

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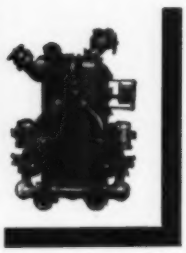

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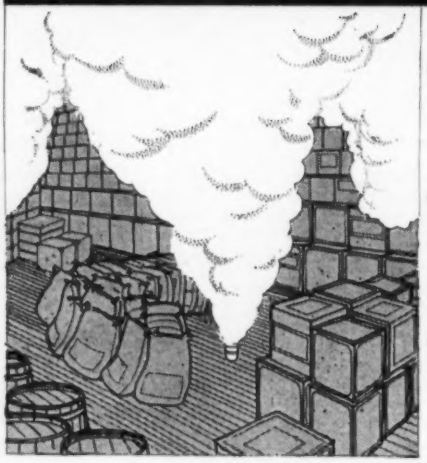

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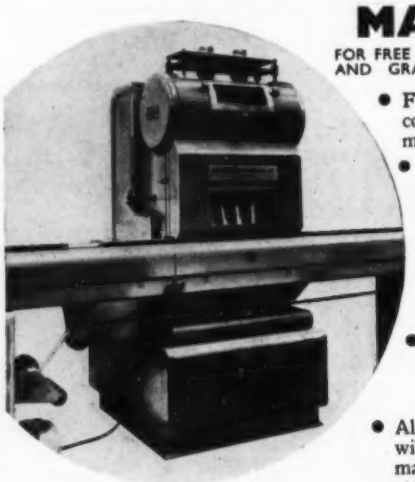

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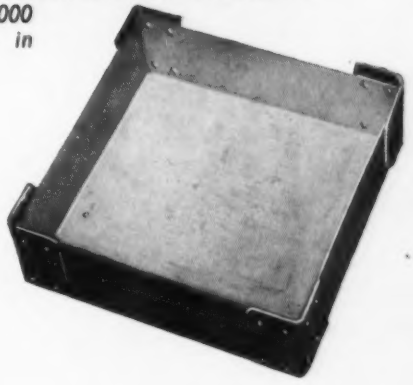

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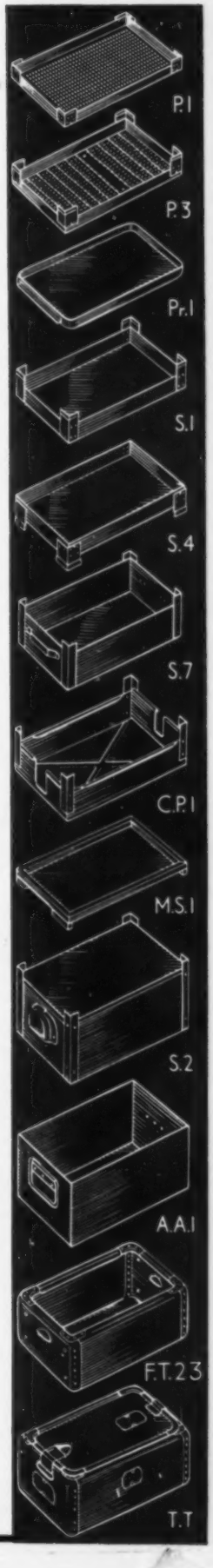

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